103rd Annual Meeting The Ohio Academy of Science Hosted by The Medical College of Ohio at Toledo April 22-24, 1994

WELCOME

The Medical College of Ohio welcomes the 103rd Annual Meeting of The Ohio Academy of Science. Founded in 1964, MCO celebrates its 30th anniversary this year as one of Ohio's leading biomedical education and research centers. We invite you to explore our campus and to share in the excitement and challenge represented in this program.

REGISTRATION

REGISTRATION IS REQUIRED FOR ALL MEETING PRESENTERS AND ATTENDEES. On-site registration will be available at a higher rate. Meals cannot be guaranteed after April 13, 1994.

To assure reservations for banquets, registrations must be received by MCO by April 13, 1994.

Please Use Registration Form on last page. Please send the completed form and fees (payable to The Medical College of Ohio) by April 13, 1994 to:

Center for Continuing Education
Medical College of Ohio
OAS Annual Meeting Registration
P.O. Box 10008
Toledo OH 43699

Phone (419) 381-4237
FAX (419) 381-4025

Registration by credit card or purchase order only will be accepted by FAX at (419) 381-4025. An acknowledgment will be sent to those preregistered and paid by April 13. Your packets, tickets, and name tag will be ready at the meeting registration desk upon your arrival.

For further information, please call (419) 381-4237 or FAX (419) 381-4025.

Friday, April 22
(Dana Conference Center, MCO)

Registration for the field trip to the Sun Oil Company and the geology symposium for Friday will be held at the Dana Conference Center at The Medical College of Ohio at Toledo. On-site registration is possible by check, VISA, or Mastercard.

Saturday, April 23
(Dana Conference Center, MCO)

Registration and all technical and poster sessions will be in Dana Conference Center at The Medical College of Ohio at Toledo. On-site registration at the meeting registration desk on the ground floor lobby of the MCO Dana Conference Center is possible by check, VISA, or Mastercard.

8:00 am - 3:00 PM for technical and poster sessions

PARKING

Use the Dana Conference Center parking lot.

SMOKING POLICY

Smoking in buildings is not permitted.

MEALS

Friday, April 22

A cafeteria and fast food restaurants are available for breakfast and lunch on and near the MCO campus. A list will be available at REGISTRATION.

6:00 PM OAS/OBS Dinner at The Hilton Inn adjacent to the Dana Conference Center (Reservations required by April 13)

Saturday, April 23

Breakfast and lunch are available in the Hilton Inn, on campus and at nearby fast food restaurants.

OAS Annual Meeting Banquet at 6:30 P.M. in Hilton Inn (Reservations required by April 13)

Sunday, April 24

The Geology Field Trip to the Essrock Materials Inc. quarry is planned between 8:30 AM. and 12 noon. Lunch will be on your own.

HOUSING

Please contact hotels and motels directly. Listed below are area motels.

HEADQUARTERS HOTEL
(Adjacent to the Dana Center on the Campus of The Medical College of Ohio at Toledo.)

Hilton Inn Toledo
3100 Glendale Ave.
Toledo OH 43614
419/381-6800 or 1-800-HILTONS

A block of rooms has been reserved at the Toledo Hilton Hotel. This hotel is located on the 350 acre campus of the Medical College of Ohio and is directly connected to the Eleanor N. Dana Conference Center by an enclosed walkway. The Toledo Hilton has a tennis court, an indoor pool, sauna and spa. Hotel guests are invited to use the Morse

Fitness Center at the Medical College of Ohio which is accessible via an enclosed walkway. This Center features a running track, racquetball and basketball courts and exercise equipment. Toledo Hilton room rates are $65.00 single or double. Please make your reservation by calling the Toledo Hilton Hotel at (419) 381-6800. Identify yourself as being with The Ohio Academy of Science Annual Meeting to receive this reduced rate.

Other Hotels

Clarion Westgate
3536 Secor Road
Toledo OH 43606
419/535-7070

Comfort Inn Westgate
3560 Secor Road
Toledo OH 43606
419/531-2666

Comfort Inn West
1426 S Reynolds Road
Maumee OH 43537
419/893-2800

Courtyard by Marriot
1435 East Mall Drive
Holland OH 43528
419/866-1001

Days Inn Toledo/Maumee
150 Dussel Drive
Maumee OH 43537
419/893-9960

Days Inn of Toledo/Perrysburg
I-75 & U.S.20 Exit 193
Perrysburg OH 43551
419/874-8771

Econo Lodge
1800 Miami St.
Toledo OH 43605
419/666-5120

Fairfield Inn by Marriott
1401 E Mall Drive
Holland OH 43528
419/867-1144

Hampton Inn Toledo South
1409 Reynolds Road
Maumee OH 43537
419/893-1004

Holiday Inn Southwyck
2429 S. Reynolds Road
Toledo OH 43614
419/381 -8765

Knights Inn Toledo West
1520 S Holland-Sylvania Road
Maumee OH 43537
419/865-1380

Knights Inn North
445 E. Alexis Road
Toledo OH 43612
419/476-0170

Maumee Bay Resort
1750 Park Road No. 2
Oregon OH 43618-9700
1-800-AT-A-PARK

Radisson Hotel Toledo
101 N. Summit St.
Toledo OH 43604
419/241-3000

Red Roof Inn Holland
1214 Corporate Drive
Holland OH 43528
419/866-5512

Red Roof Inn Maumee
1570 S. Reynolds Road
Maumee OH 43537
419/893-0292

Red Roof Inn Secor
3530 Executive Parkway
Toledo OH 43606
419/536-0118

Residence Inn
6101 Trust Drive
Holland OH 43528
419/867-9555

Toledo Airport Motel
11201 Airport Service Road
Swanton OH 43538
419/865-5531

Toledo Budget Inn
2450 S. Reynolds Rodd
Toledo 43614
419/865-0201

Toledo Marriott
2 Seagate
Toledo OH 43604
419/241-1411

GENERAL SCHEDULE

Friday, April 22, 1994

8:00 AM - 3:00 PM	Registration in the Dana Conference Center, MCO
9:00 AM - 11:30 AM	Tour of Sun Company Refinery Pick up map at Registration in the Dana Conference Center.

The tour of Sun Company's Refinery will include a brief presentation of the refinery's history and the major units to process crude oil into gasoline and other hydrocarbon products. The presentation and the bus tour within the refinery will focus on the numerous source reduction/waste minimization efforts and opportunities that the refinery has accomplished. The bus tour will include a stop at the new wastewater treatment unit that was put into service last year at a project cost of $47 million. The tour will be limited to 80 persons. See related environmental symposium on Saturday.

9:30 AM - noon	Geology Symposium (See abstracts for details)
12:00 noon	Lunch (on your own)
1:30 PM - 5:00 PM	Geology Symposium
2:00 - 5:00 PM	Ohio Academy of Science Governing Council Meeting in the Dana Conference Center Huron Room
3:00 - 5:00 PM	OBS Executive Committee Meeting in the Dana Conference Center Hancock Room
5:00 - 6:00 PM	Reception at the Hilton Inn
6:00 PM	Joint Dinner of Ohio Academy of Science and Ohio Biological Survey at the Hilton Inn
8:00 PM	Ohio Biological Survey Advisory Council in the Dana Conference Center Seneca Room

Saturday, April 23, 1994

8:00 AM - 3:00 PM	Registration in the Dana Conference Center
8:00 AM - 9:00 AM	Past Presidents' Breakfast
9:00 AM - 11:00 AM	Morning poster and podium presentations
9:30 AM - 10:30 AM	Internet Workshop
11:15 AM	**ALL ACADEMY LECTURE** in the Dana Conference Center Lucas auditorium

ROGER C. BONE, M.D.
President and Chief Executive Officer
Medical College of Ohio at Toledo

Roger C. Bone, M.D., the fourth president of the Medical College of Ohio, assumed the position September. 1, 1993.

Dr. Bone is a former dean of Rush University Medical College, where he held two endowed chairs, and served as vice president of medical affairs at Rush-Presbyterian-St. Luke's Medical Center in Chicago.

A graduate of Hendrix College in Conaway, Arkansas, Dr. Bone received his doctor of medicine degree in 1967 from the University of Arkansas Medical School. He completed his residency and fellowship training in pulmonary medicine at the University of Texas Southwestern Medical College in Dallas between 1970 and 1974.

Dr. Bone was a captain in the United States Army from 1967 to 1969 and served in Cue Chi, Vietnam. He was awarded the Army Commendation Medal for Valor and the Army Commendation Medal for Distinguished Service.

From 1974 to 1977, Dr. Bone was a faculty member at the University of Kansas Medical Center in Kansas City, Missouri, and consultant to the Missouri Veteran's Administration Hospital. In 1977, he was named an associate professor of medicine and chief of the pulmonary division of the University of Arkansas for Medical Sciences-Veteran's Administration Complex in Little Rock. In 1979, he was named an professor of medicine.

Dr. Bone joined the faculty of Rush Medical College in 1984 as professor and chairman of the Department of Medicine. He was named dean and vice president for medical affairs in 1992, and served as chief of the Medical Center's pulmonary and critical care division. He was named a Master Teacher in 1993 by the American College of Chest Physicians. He also served as host of "Internal Medicine Update," a weekly program for physicians that was carried nationally on cable television.

Dr. Bone has been a consulting editor of the Journal of the American Medical Association, and is cochairman of the editorial board of the Journal of Critical Illness. He is senior editor of Critical Care Medicine and has been a department editor of Concepts in Emergency and Critical Care Medicine. He is co-editor-in-chief of the Yearbook of Pulmonary Disease, serves on the editorial boards of numerous journals, and is editor-in-chief of the two volume Textbook of Pulmonary and Critical Care Medicine.

Dr. Bone's research in the field of pulmonary medicine and critical care has been supported by funding from the National Institutes of Health, the United States Environmental Protection Agency, and private industry. He has published extensively in scientific journals and had edited more than 30 books.

Dr. Bone is a past president of the American College of Chest Physicians and the International Academy of Chest Physicians and Surgeons. He is a lifetime Honorary Member of the American Association of Respiratory Care.

12:00 noon	Lunch (on your own)
1:30 PM - 5:00 PM	Afternoon poster and podium presentations
5:15 PM	Annual Business Session for Academy Members Only
5:30 - 6:30 PM	Reception in the Hilton Inn
6:30 PM	Banquet and Awards Ceremony in the Hilton Inn
	Recognition of Newly Elected Fellows by Dr. Ronald L. Stuckey, President Elect
	Other Awardees
	President's Address: *Interregional Trade, the Adjunct to Development Policy*

DR. RICHARD W. JANSON
The Janson Industries
Canton, Ohio

Since 1986 when the Ph.D. degree in Geography was conferred by Kent State University, the focus of Richard W. Janson's post doctoral research has been on mathematical modeling of large, complex production systems, including: (1) methods for simultaneous solution of all sector, all-region trade; (2) methods for evaluation of differential regional effects, including feedback effects; and (3) policy formulation for the Ohio economic-spatial system. His formal academic work included undergraduate work in physics at Denison University, the study of geography at Kent State University, and economics at The University of Chicago and Duke University.

Approximately 50 papers have been published under the authorship of Richard W. Janson. Most have been on topics related to economic development including papers on defense industry, small business, high technology industry, historical development of regions, maquiladora operations, Markovian analysis, development policy for Ohio, input-output modeling, interregional trade, industrial location, market targeting models, and the comparative advantage of regions. All of the papers have been presented at meetings or sessions of professional groups or were presented to boards or committees to assist policy evaluation or were published in regarded journals including The Ohio Journal of Science.

As a charter member of the Industrial Technology and Development Enterprise Advisory Board (The Edison Board) President Janson has served continuously for both Governors Richard F. Celeste and George V. Voinovich, since the legislature of Ohio created the Board. This Board has been charged with guiding the State of Ohio in the establishment of policies for successful transition of the industries of Ohio into the next century: that is, into the global economy of the developed world. The Edison Board has established high technology research centers. Three centers have core technologies that cross all manufacturing industries—welding, polymers, and advanced materials; three centers are regionally based and specialize in advanced manufacturing technologies; and one is focused on biotechnologies—medical applications and directed genetic research. In addition, related centers for artificial intelligence, sensor technology, technology transfer, technology development, and training have been funded and supported through the Edison initiatives. All of the Edison Centers are based on the comparative advantage of the regional industries and the regional universities. The Board has also funded high technology research by seed development grants and several small business, start-up centers (incubators). Dr. Janson serves as the Chairman of the Edison Board.

The Janson brothers, Richard and Raymond, have owned and operated The Janson Industries for almost 35 years. During this time they have performed several thousand stage equipment and stage lighting contracts throughout Ohio, the nation and overseas. They were also the dominant source for planetariums and driver trainer simulators in schools and universities throughout the United States. The Janson Industries constructed, and operated a commercial UHF television station, WJAN TV, in Canton for ten years.

Dr. Janson served as a trustee of The Wilderness Center in Stark County, Ohio during its formative period. The Center is a research and educational institution that serves the people of northern Ohio, especially school children, and consists of a primitive area and farm that comprise about 1000 acres with some primeval forest, and an interpretive building.

Dr. Janson also serves as a member of the Governing Board of the American Geographical Society and as an adjunct Professor of Geography at Kent State University.

Sunday, April 24, 1994

8:30 AM - 12:00 Noon Geology Field Trip

Sponsored by The Ohio Senior Academy of Science Division of Earth & Space Sciences. Arranged and led by Dr's. Mark J. Camp and Craig B. Hatfield, Dept. of Geology, University of Toledo.

Stratigraphy and paleontology of the Middle Devonian Silica Shale of Essroc Materials Inc. quarry at Sylvania, Ohio.

Leave at 8:30 AM from the parking lot on the south side of the MCO Hilton, across from rear of J.C. Penney's store. Carpooling is requested. Limited to the first 25 registrants. See checkoff on registration form. Lunch on your own. For more information call Dr. Camp at (419) 537-2398.

Special Acknowledgment

The Ohio Academy of Science and The Medical College of Ohio express their appreciation to the Sun Company, Inc. for partial support of this meeting.

LOCAL ARRANGEMENTS COMMITTEE

Co-Chairs

RICHARD F. LEIGHTON, M.D.
Vice President for Academic Affairs, and
Dean, School of Medicine

and

RANDALL RUCH, PH.D.
Assistant Professor
Department of Pathology

OUR HOST: ACADEMIC HIGHLIGHTS OF THE MEDICAL COLLEGE OF OHIO AT TOLEDO

The Medical College of Ohio observes its 30th birthday this year. It was created by legislation approved by the Ohio General Assembly and signed into law by then-Governor James A. Rhodes on December 18, 1964. The action was the culmination of studies that began in 1960 when Toledo mayor, Michael Damas, named a citizen committee to determine the need for a medical school in northwestern Ohio. The committee, with strong support from the local medical community, and

business and industry, unanimously agreed on the need, and over the next four years carried the message to the Legislature.

In early January, 1965, the nine-member Board of Trustees named by Governor Rhodes held its initial meeting. Over the next 18 months the Board hired the college's first president, Glidden Brooks, M.D., began hiring staff and faculty, adopted a master plan, and leased what became known as the East Campus at South Detroit and Arlington avenues. The property included Maumee Valley Hospital, its school of nursing dormitory, and the William Roche Memorial Hospital.

There were 158 employees, including 59 faculty members and 10 administrators, on staff when the first class of 32 medical students began studies in the fall of 1969. More than 175 community physicians volunteered their services as teachers.

The master plan called for college development on 346 acres of land acquired in September, 1966, from the Department of Mental Hygiene and Corrections west of the Toledo Mental Health Center between Arlington and Glendale avenues. Construction of the Health Science Building, the first structure on the present campus, began in 1970.

Dr. Brooks, who guided the college during this period in which the School of Allied Health and the School of Nursing were established, resigned in June, 1971. He was succeeded by Marion Anderson, M.D., who served as president from October 16, 1972, to May 23, 1977.

The College's clinical development began under Dr. Anderson and creation of the graduate school was approved by The Ohio Board of Regents July 18, 1975. The Health Science, Mulford Library and Health Education buildings were completed under his administration.

Richard D. Ruppert, M.D., was MCO's third president, holding the office for 16 years, from September, 1977, until his retirement August 30, 1993. During this period the college saw expanding clinical services and patient care, increasing biomedical research activities, expanding academic offerings, and completion of the campus master plan that was approved by the college's first Board of Trustees. This included completion of the Ida Marie Dowling Hall, Medical College Hospital, Facilities Support Building, the Lenore W. and Marvin S. Kobacker Center, the Eleanor N. Dana Conference Center, the Richard C. Ruppert Health Center, the Toledo Hilton Hotel, and the Dorothy and Ashel Bryan Academic Commons.

Under its fourth and current president, Roger C. Bone, M.D. the Medical College of Ohio is charting an aggressive course for future growth and development. Construction will begin soon on a new classroom building for the School of Nursing and the School of Allied Health. And, construction of the first buildings in the Northwest Ohio Advanced Technology Park at the Medical College of Ohio is expected to begin this year. The 233 acre technology park is designed to provide sites for scientifically and technically oriented enterprises.

The college has become one of Ohio's premier biomedical research centers. In 1993, its scientists attracted $13.4 million in research funding, $10 million of which were research grants and contracts awarded by the Public Health Service, primarily from the National Institutes of Health.

Today there are 316 basic and clinical faculty members in the School of Medicine and 73 faculty members in the School of Nursing and School of Allied Health. More than 500 area physicians serve the college as advisers, student preceptors and in other activities.

Since the first class of 32 medical students who graduated in 1972, the Medical College of Ohio has conferred 2,248 doctor of medicine degrees, 125 doctor of philosophy degrees in medical sciences, and 289 masters' degrees in nursing, biomedical sciences, and occupational health. The first class of seven students in the master of occupational therapy program completed their studies in January, 1994.

The school of Medicine currently enrolls 135 students each fall in a four-year curriculum that leads to the Doctor of Medicine degree. The students admitted to the program beginning in fall, 1994, are being selected from 5,178 individuals who submitted applications by the deadline last December 1.

Under the guidance of superb mentors, students pursue classroom, clinical and laboratory work in modern settings with the latest equipment. The curriculum provides students with clinical experiences in campus hospitals and in associated hospitals in Toledo and at sites serving the poor and the homeless. Students also gain one-on-one experiences with physicians and in medical settings in numerous northwestern Ohio communities through the Area Health Education Center programs.

More than 475 students are enrolled in the Graduate School working toward doctor of philosophy in medical sciences, combined doctor of medicine/doctor of philosophy degrees, and master degrees in biomedical sciences, nursing, occupational therapy, and occupational health.

Of the Graduate School students, 134 are studying for the Ph.D. degree; 12 for an M.D./Ph.D.; 55 for master's degree in biomedical sciences; 164 for the master's degree in nursing; 58 in occupational therapy, and 54 for a master of science in occupational health. The Graduate School enrolls about 160 first time entering students each year.

Through alliances with the University of Toledo and Bowling Green State University, the MCO School of Nursing and the MCO School of Allied Health provide the clinical and professional education for students enrolled in nursing and physical therapy. The college serves as a clinical site for other health professionals enrolled at other institutions of higher education in Ohio.

More than 380 students enrolled in the bachelor of science in nursing programs at the University of Toledo and Bowling Green State University this academic year are taking their professional courses at MCO. An additional 106 registered nurses are enrolled in the BSN program. At the graduate school level, 164 registered nurses with baccalaureate degrees are studying for master of science in nursing degrees at MCO.

Eighty-four students enrolled in the physical therapy programs this school year at UT and BGSU are taking their professional courses in MCO's School of Allied Health.

SYMPOSIUM: Joints in Fine-grained Materials and Contaminant Remediation Strategies in the Ohio Lake Plain and Beyond. 9:30 AM, Friday, April 22, 1994 Defiance

C. Scott Brockman, Presiding

ARRANGED BY: C. SCOTT BROCKMAN, OHIO GEOLOGICAL SURVEY, AND COORDINATOR, DIVISION OF EARTH & SPACE SCIENCES, THE OHIO ACADEMY OF SCIENCE; JULIE WEATHERINGTON-RICE, BENNETT & WILLIAMS CONSULTING GEOLOGISTS

SPONSORED BY THE OHIO SENIOR ACADEMY OF SCIENCE DIVISION OF EARTH & SPACE SCIENCES

Why do fluids in clayey unconsolidated materials sometimes migrate thousands of times faster than the most careful testing would suggest? Joints, naturally occurring cracks and fractures, are now receiving well deserved scrutiny as likely pathways in many cases. Joints affect a wide rage of subsurface phenomena from groundwater recharge to contaminant-fluid and -vapor migration and likewise an array of in-ground structures such as landfills, wells, and tanks. This symposium will address the geology of joints in fine-grained unconsolidated materials, new and needed joint-related mitigation technologies, and case histories. Contact Scott Brockman for details: (614) 265-7054.

9:30 AM - JOINTS AND THEIR GEOLOGICAL SETTING

THE PHYSICAL SETTING OF THE OHIO LAKE PLAIN. GEORGE HALL, AGRONOMY DEPT. THE OHIO STATE UNIVERSITY, 2021 COFFEY RD., COLUMBUS OH 43210.

FRACTURE FLOW IN FINE-GRAINED MATERIALS IN NORTHERN OHIO TWO SITE INVESTIGATIONS. JULIE P. WEATHERINGTON-RICE AND MICHAEL P. ANGLE, BENNETT & WILLIAMS, INC., 2700 E. DUBLIN GRANVILLE RD., COLUMBUS OH 43231.

For many years, the authors, like many geologists/soil scientists, have noted fractures in fine-grained glacial materials which allowed for rapid water migration in what is typically considered tight formations. In June, 1992, Ms. Rice led a site investigation in conjunction with SCS and OEPA in the lake plains at Miller City, Putnam Co where active vertical fractures were found in a back-hoe test pit to the depth of almost 20 feet. Water table fluctuations were more rapid then traditional testing methods would indicate at this site. This site investigation resulted in the formation of the Ohio Lake Plains working group who have developed a bibliography of current literature, held meetings and made presentations in 1993 and 1994, including this symposium. In August, 1993, another site investigation, led by Mr. Angle, ODNR, Div. of Water, was undertaken in fine grained materials. Materials at the site were glacial tills and slack-water deposits in an end moraine setting just west of Fowler Woods State Nature Preserve in Richland Co. Back hoe trenches 8-10 feet deep showed vertical fractures 6-8 inches apart at base. Piezometers were installed using McKay et. al (1993) recommendations. Standard tests indicated hydraulic conductivity of materials in the 10-7 or 10-8 range, predicting very slow water movement through the deposits. Actual observations do not support the test results. Surface rainfall events reach installed piezometers in days instead of months or years. Methods for testing the in-situ permeabilities and designs for monitoring the ground water for such sites needs to be re-evaluated.

ORIGIN, DISTRIBUTION AND HYDRAULIC INFLUENCE OF FRACTURES IN CLAY-RICH TILLS IN ONTARIO AND DENMARK. LARRY D. MCKAY, UNIVERSITY OF TENNESSEE, DEPT. OF GEOLOGICAL SCIENCES, KNOXVILLE TN 37996-1410 AND JOHNNY FREDERICIA, GEOL. SURVEY OF DENMARK.

In the extensive clay plains of southwestern Ontario visibly oxidized fractures typically extend to about 6-8 m depth. The fractures are predominantly vertical and are believed to have formed due to desiccation during post-depositional periods of low water table. This is supported by the presence of a stiff crust in the oxidized zone and the absence of preferred fracture orientations or till fabric orientations. Hydraulic conductivity of this zone is often 2-3 orders of magnitude higher than the underlying clays. Tritium has been found to depths of up to 12 m indicating the presence of hydraulically active fractures below the depth of visible oxidation. The Canadian tills are compared to lodgement tills in Denmark which contain both glacially-induced fractures and post-depositional desiccation fractures. The two types of fractured till, although of very different origin, have similar hydraulic properties.

THE OCCURRENCE OF JOINTS IN SOME UNCONSOLIDATED CORES IN OHIO. C. SCOTT BROCKMAN, OHIO GEOLOGICAL SURVEY, 4383 FOUNTAIN SQUARE DR., COLUMBUS OH 43224.

Twenty-nine continuous cores were evaluated for the occurrence of joints. Joints were defined as near-vertical fractures below the solum with faces apart or loosely joined, generally coated with secondary minerals, illuvial materials and rootlets; they are capable of transmitting fluids. In cores of Late Wisconsinan clayey-silt till north of the front of the Powell moraine (n=19), the range, mean and standard deviation of observed joint depths are, respectively, 7.0-19.1', 12.5', and 3.6'. Joint depths are shallower on ground moraine (mean=11.1'; n=12) than on ridge moraine (mean=15.0'; n=7). Lacustrine materials of much older Teays-age terraces (>730,000 yr; n=4) have the same mean joint depth as the single core of Late Wisconsinan (<15,000 yr) lacustrine silt, 9.5'. In cores of fluvial materials (n=2), joints were present to 8' in a sandy silt and not present in a core of silt and medium sand. Stratigraphic position and thickness of sand may control jointing in till in some cases. For example, 2 cores from the Lake Plain with 4-8' of sand over till contain no joints; in 3 cores, joints in till terminated in the vicinity of sands >12" thick; however, in the 3 cores with thin (few inches) interlayers of sand, joints in till were present above and below the sand. Surficial oxidized horizons closely follow joint-depth trends, are more easily identified than joints in core and may sometimes serve as proxy for joint depth estimates. The oxidation limit is about 1' deeper than the observed limit of jointing. However, buried oxidized horizons, considered possible truncated paleosols, had no evidence of jointing (n=2). Seven paleosols were observed in cores. One of 3 bedrock residual paleosols in shale had relic partings inferred to be capable of transmitting fluids, as did 1 of 4 paleosols in non-bedrock parent materials.

DISCUSSION

LUNCH - ON YOUR OWN

1:30 PM - MITIGATION TECHNIQUES

THE IMPACT OF DESICCATION FRACTURES AND RELIC ANIMAL BURROWS ON THE RELIABILITY OF SITE EVALUATIONS AND REMEDIATION; A PCB REMOVAL IN MONTGOMERY COUNTY, OHIO. MICHAEL K. DALTON, OHIO EPA CENTRAL DISTRICT OFFICE, P. O. BOX 2198, COLUMBUS OH 43266-2198.

A PCB removal action at a site near Dayton was complicated by migration of PCB contaminated oil along fractures in glacial till. In-filled animal burrows at the site may also have allowed vertical migration. Traditional investigative methods failed to identify the true scope of the necessary removal action. The resulting cost over-run ended the removal action prior to completion. The inadequacy of current investigative methods results in numerous failures to properly remediate sites. French drains used for both observation and remediation are highly recommended in sites where fractures may be present.

CONTAMINANT MIGRATION EXPERIMENTS AND FIELD STUDIES IN FRACTURED CLAY TILLS. LARRY D. MCKAY, UNIVERSITY OF TENNESSEE, DEPT. OF GEOLOGICAL SCIENCES, KNOXVILLE TN 37996-1410.

A series of field and laboratory tracer experiments in fractured clay tills in southwestern Ontario and Denmark show that fractures greatly increase the potential for rapid contaminant migration in fractured clay tills. Migration of solutes is controlled by advective transport through the fractures combined with diffusion into the relatively immobile pore water between fractures. This "matrix diffusion" process has profound implications for monitoring and remediation of solutes in fractured clays, because invariably, most of the mass of solute resides in the diffusion-controlled matrix rather than in the fractures. Migration of colloidal tracers (bacteriophage) which are size-excluded from the small pores in the blocks between fractures have been observed at rates up to 100 times faster than non-reactive solutes and are of the same magnitude as calculated fracture flow velocities (m's per day). Entry of a dense creosote mixture into a sample of fractured till was found to depend on the fluid properties, the fracture aperture and the injection pressure (or depth of ponded creosote). Field studies of contamination at a hazardous waste landfill and at a transformer storage facility where a PCB-containing DNAPL was spilled are consistent with the experimental studies.

HYDRAULIC FRACTURES TO ENHANCE THE REMEDIATION OF FINE-GRAINED GLACIAL SEDIMENTS. LARRY MURDOCH, CENTER FOR GEOENVIRONMENTAL SCIENCE AND TECHNOLOGY, CIVIL ENGINEERING DEPT., UNIVERSITY OF CINCINNATI, 1275 SECTION RD., CINCINNATI OH 45237.

A method of creating hydraulic fractures in soil has been developed and tested at sites underlain by silty clay glacial drift in the midwest, or by swelling clay in the Gulf Coast region. Most of the 150 fractures created to date were initiated at depths of 1.5 to 5 m and grew away from the point of injection to form gently dipping features between 6 and 10 m in maximum dimension. The fractures were filled with between 250 and 700 kg of well-sorted, coarse-grained sand to create an average permeable thickness of 5 to 10 mm. Hydraulic fractures filled with coarse-grained sand have been used to increase the rate of fluid flow during vapor extraction, bioremediation and liquid recovery from tight soils. During tests involving vapor extraction, we showed that both the volumetric discharge and the rate of recovery of contaminants from a fracture was approximately 15 times greater than from a control well. The area affected by suction ranged from 0.5 to 1 m from a conventional well, whereas it was 6 to 10 m from a well intersecting sand-filled fractures. My colleagues and I are currently developing methods to create hydraulic fractures filled with electrically conductive graphite, which will produce disk-shaped electrodes to either enhance electrokinetic migration of contaminants or initiate electrically driven vitrification of contaminated soil. In another application, we are developing biologically or chemically active compounds that will be injected into hydraulic fractures to create zones that will degrade contaminants in situ.

DISCUSSION

WORKSHOP: Learning to Drive on the Internet Highway
9:00 AM, Saturday, April 23, 1994
Auglaize

LEARNING TO DRIVE ON THE INTERNET HIGHWAY. Alan A. Herbert, Director of Academic User Services, Information Service, University of Akron, Akron OH 44325-3501.

A lot of attention has been recently focused on the concept of a 'Super Communication Highway'. This 'Highway' will allow everyone to communicate with everyone else. A similar highway already exists for many people. This highway is called the Internet. This one hour workshop will help you find out how to access information via this network. Examples of searching for and retrieving research information will be demonstrated. Below is a brief outline of my presentation.

I. What is the Internet?
   A. Who presently has accesses?
   B. How does one gain access?

II. Tools for Internet access
   A. Telnet - Remote access to computers
   B. FTP - File transfer Program

III. Live Demonstration of Information Searches

IV. Discussion on how this highway can be used to develop and update a Resource List.

SYMPOSIUM: CERES PRINCIPLES
9:00 AM, Saturday, April 23, 1994
Allen
F. John Kluth, Presiding

This symposium is cosponsored by The Ohio Senior Academy of Science Division of Environmental Sciences & Resources Management and The Ohio Industrial and Business Council.

9:00 THE CERES PRINCIPLES: A SUN COMPANY COMMITMENT TO ENVIRONMENTAL ACCOUNTABILITY. Mr. Ted Grabowski, Director of Environmental Affairs, Sun Oil Co., 1801 Market St., Philadelphia PA 19103-1699.

In 1993, Sun Company became the first Fortune 500 company to formally endorse the CERES principles; a code of corporate environmental conduct created by the Coalition of Environmentally Responsible Economies. This presentation will describe the history and current status of the relationship between Sun and CERES, the rationale used by Sun to endorse the principles and the results of Sun's actions to date. In addition, the presentation, will discuss the impact that the CERES relationship has had within and outside the company and will list and describe some of the benefits, cost, and issues associated with endorsement.

9:45 A PROPOSAL DOCUMENTING THE VALUE OF THE CERES PRINCIPLES FOR OHIO. F. John Kluth, National Machine Company, 4880 Hudson Drive, Stow OH 44224-1799.

The CERES Principles are a model corporate code of environmental conduct promoted by the Coalition for Environmentally Responsible Economies (CERES). This coalition is a non-profit membership organization comprised of leading social investors, major environmental groups, public pensions, labor organizations, and public interest groups. These principles include protection of the biosphere, sustainable use of natural resources, reduction and elimination of wastes, energy conservation, risk reduction, production of safe products and services, keeping the public informed, maintaining a management commitment, and maintaining audits and reports. These principles need to be applied to a company in Ohio in a controlled way as a pilot project to determine their effect on the economy, environment, and the development of science in Ohio.

PANEL DISCUSSION

POSTER SESSION
9:00 AM, Saturday, April 23, 1994
Dana-Hilton Connector

Board A THE EFFECT OF LIVE ARKANSAS-99 INFECTIOUS BRONCHITIS VIRUS (IBV) VACCINE ON PULLETS BEGINNING EGG PRODUCTION. M.J. Toussant, D.E. Swayne, Y.M. Saif and J.D. Latshaw, Dept. of Poultry Science, Ohio State University, Columbus OH 43210.

The effects of live Arkansas-99 vaccine, administered at up to 1000 doses per bird, on groups of specific-pathogen free pullets at the onset of egg production and at peak production were examined. The responses of egg production, composition and quality and oviduct histology to vaccination were examined. Much higher than recommended doses of Arkansas-99 vaccine, given i.v., were relatively well tolerated. The only adverse effects were moderate respiratory symptoms of IBV disease and, for the group given 1000 vaccine doses/bird, a slight delay in egg production initiation. Interior egg quality (as Haugh unit values), crude egg albumen ovomucin yield, and oviduct histology were not affected by the treatments. Serum IBV antibody response to very high vaccine doses was also rather moderate, with no difference in titer being observed between the groups receiving 10 and 1000 vaccine doses/bird. These results suggest that there may be less risk associated with vaccination with a live IBV in pullets at the onset of egg production than is generally believed.

Board B STRUCTURE/FUNCTION ANALYSIS OF THE MATURE REGION OF TRANSFORMING GROWTH FACTOR BETA 1. Kadam Anuradha, Medical College of Ohio, Dept. of Biochemistry & Molecular Biology, PO Box 10008, Toledo OH 43699-0008.

Transforming growth factor-beta-1 (TGF-β1) is a disulfide-linked timer of two identical chains of 112 amino acids, originating from the carboxyl-terminal region of a large precursor by proteolytic cleavage. This growth factor molecule is involved in cell growth and differentiation. To understand the functional domains of the mature region of TGF-β1, eight, four amino acid site-specific insertion mutants, predetermined by restriction sites have been prepared. Several of these insertions had drastic affects on secretion resulting in accumulation of TGF-β1 intracellularly. The mutants In286 and In335 were secreted as TGF-β1 dimers and showed biological activity on Mink lung epithelial cells. To block the formation of the large disulfide complex, we utilized oligonucleotide mutagenesis to change the precursor Cys-33 residue to Ser. This Cys-33 residue has been shown to form a disulfide crosslink with the mature TGF-β1 molecule. This alteration was then placed in each of the above insertion mutants and its effect on TGF-β1 secretion was then evaluated. In the double mutants, two additional disulfide-linked forms of mutant TGF-β1s were produced (In342 and In349). Thus, from eight insertions, we have produced four disulfide-folded, site-specific mutants which, based on their migration on SDS-polyacrylamide gels, appear to be properly folded. This will enable us to determine the role that these insertion mutants play for functional interaction in the latent complex and for binding to the TGF-β1 receptor.

Board C INVESTIGATION INTO C-TERMINUS MODIFICATIONS ON THE STRUCTURE/ACTIVITY RELATIONSHIPS OF THE TRANSFORMING GROWTH FACTOR BETA1 (TGF-BETA1) MOLECULE. S. Lakshmi Iyer and L.E. Gentry, Dept. of Biochemistry and Molecular Biology, Medical College of Ohio, PO Box 10008, Toledo OH 43699-0008.

Transforming growth factor beta 1 (TGF-β1) is a pleiotropic regulator of cell growth and differentiation. The C-terminus of the TGF-β's are highly conserved. Any modifications of the C-terminus may affect its structural integrity and biological activity. We propose to use the molecular approach to generate antagonists or superagonists of the TGF-β1 by incorporating subtle single amino acid modifications at the C-terminus end of TGF-β1. Here, we describe the construction of three genetically engineered C-terminal TGF-β mutants using polymerase chain reaction: i) TGF-β-Alanine (TGF-β-Ala) contains an alanine for serine substitution at position 390 at the C-terminus of TGF-β1; ii) TGF-β-Glycine (TGF-β-Gly) has a glycine residue added after serine 390; iii) TGF-β-Tryptophan (TGF-β-Trp) has a tryptophan residue added after serine 390. Mutation of cysteine residue (C-33) in the precursor proregion was placed upstream of the C-terminus modified mutants. This results in the synthesis and secretion of active, as opposed to latent, TGF-β (Brunner et al., J. Biol. Chem. 264:13660-1366, 1989). The TGF-β mutants were identified and confirmed by restriction analysis, and/or by sequencing. Preliminary Western blot analysis indicated that the C-terminus mutants may be synthesized. Biological activity of TGF-β mutants made by transfectants is under investigation. Future studies will include the coexpression of the TGF-β mutants with wild type TGF-β1 to test the dominant negative effect for TGF-β secretion. The data from these studies should yield information on the structure/activity relationship and physiological functions of the TGF-β1.

Board D PLANT ANATOMY RESEARCH DESIGNED TO IMPROVE CRITICAL THINKING SKILLS. John L. Frola and David J. Stroup, Dept. of Biology, University of Akron, Akron OH 44325-3908.

A seasonal study of two plant species is currently under investigation. Observations of the shoot apices are described based on an analysis of the theories on shoot apical organization. Measurements of apical dome height and width of the two species were obtained to serve as

a basis for classroom discussions concerning the changes in apical organization over a one-year period. A multi-media presentation was prepared for students to make observations and generate hypotheses about shoot development. During classroom discussion fundamental anatomical and morphological questions were generated to be used as the basis for independent student laboratory projects. This research and our teaching strategy was designed to improve identified student thinking skills, as well as describe our current understanding of shoot apical development.

BOARD E GROWTH RELATED EXPRESSION OF INTEGRIN ALPHA5 SUBUNIT IN HUMAN FIBROSARCOMA CELLS. DANHUI WANG, MICHAEL G. BRATTAIN, AND LUZHE SUN, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

The purpose of this study was to explore the effect of cell growth on integrin α5 subunit expression at transcriptional and post-transcriptional levels in human fibrosarcoma HT1080 cells. Integrin α5 mRNA steady state level was increased more than two-fold after release from quiescence. Immunoprecipitation with an anti-α5 monoclonal antibody showed that protein expression was also induced. The increased α5 expression on the cell surface led to increased binding to fibronectin. The induction of α5 mRNA and protein levels in HT1080 cells was due to increased transcription and the responsive cis-element was localized -92 and -41 with respect to the transcription start site of the α5 promoter. To further investigate the role of integrin α5 in relation to the initiation of DNA synthesis, anti-α5 monoclonal antibody was added to exponentially growing cells and quiescence-released cells. Blockade of FN binding to its α5β1 receptor by the antibody stimulated DNA synthesis in cells released from quiescence but not in exponentially growing cells. These results suggest that integrin α5β1 may act as a negative regulator in cell growth control.

BOARD F EXPRESSION OF TGF-BETA ISOFORMS AND THEIR TYPE II RECEPTOR IN THE MCF-7 BREAST CANCER CELL LINE. KANE WU, LARRY E. GENTRY, MICHAEL BRATTAIN, LUZHE SUN, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

TGF-β affects cellular proliferation and differentiation primarily through interaction with its membrane binding proteins. Three major cell surface binding proteins have been identified and designated as type I, II, and III receptors. Type I and II receptors are primarily responsible for TGF-β signal transduction. Quantitative RNase protection assay and chemical cross-linking were carried out to examine mRNA and protein levels of TGF-β1, β2, and type II receptor(RII) in the MCF-7 breast cancer cell line. MCF-7 parental cells showed a high level of TGF-β1 mRNA expression while expression of RII mRNA was low. The low level of RII expression was reflected by the resistance of the cell line to the inhibitory effects of TGF-β in proliferation assays. Variations of both TGF-β isoforms and RII expression were observed among different clones obtained by limiting dilution. To determine whether modulation of RII expression in MCF-7 clones will alter TGF-β sensitivity, a tetracycline- controlled transactivator (tTA) dependent promoter was tested for activity and then used in RII cDNA sub cloning and expression. Sense and antisense RII cDNA-tTA promoter constructs were obtained. Transient transfection with sense construct into MCF-7 parental cell line showed the expression of the recombinant RII and modulation by tetracycline. Initial result of H^3-thymidine incorporation experiment demonstrated increased TGF-β sensitivity in MCF-7 RII stable transfection clones. Whether this modulation is due to increased RII expression needs to be further determined.

BOARD G EXPRESSION OF TGF-BETA RECEPTOR II IN HUMAN COLON CARCINOMA CELL LINES WITH DIFFERENT SENSITIVITIES TO TGF-BETA. JENNY WANG, LARRY E. GENTRY, MICHAEL G. BRATTAIN, AND LUZHE SUN, DEPT. OF BIOCHEMISTRY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Transforming growth factor-β (TGF-β) is a multi-function protein that regulates cell proliferation, differentiation and extracellular matrix expression. It elicits its responses by binding specifically to cell surface proteins. Most cells have three types of TGF-β receptors termed type I, type II, and type III. Type II receptor is regarded as essential for TGF-β signal transduction involving inhibitory responses through its transmembrane serine-threonine kinase. Since different human colon carcinoma cell lines show different sensitivities to TGF-β, we wanted to measure the expression levels of type II receptor in these cell lines to see whether its expression correlates to TGF-β sensitivity. We used an RNase protection assay to detect the mRNA levels and cross-linking to detect the protein levels of TGF-β receptors. It was found that the cell lines which are sensitive to TGF-β have higher levels of RII mRNA and protein than the cell lines which are resistant to TGF-β. This suggests that type II receptor may play an important role in conferring sensitivity to TGFβ. We are currently transfecting sense type II cDNA expression vector into the TGF-β resistant cell lines in an attempt to restore TGF-β sensitivity of these cell lines.

BOARD H MICROBIAL FLORA ON BIRDS: DIVERSITY AND ECOLOGICAL ASSOCIATIONS. STEPHEN E. KACIR, EDWARD H. BURTT JR.AND JANN M. ICHIDA, OHIO WESLEYAN UNIVERSITY, DEPT. OF ZOOLOGY, DELAWARE OH 43015.

The microbial flora of the feathers and skin of wild birds is undescribed. We isolated bacterial and fungal samples from birds captured from May 1993 to March 1994. Spore-forming and nonspore-forming rod-shaped bacteria were found along with gram-positive cocci bacteria. Among the species we have identified are *Bacillus licheniformis, B. subtilis, B. pumilus, E. coli* and other coliforms also *Staphlococcus sp.* We have also identified actinomycetes, *Penicillium* sp., and *Aspergillis sp.* Bacteria and fungi were found on the back, stomach, head, wings, and tail. Birds that forage in the air had fewer bacteria than birds that foraged in brush which had fewer bacteria than birds that foraged on the ground. Birds with more fungi tended to have fewer bacteria. (Supported by the Ohio Wesleyan University/Howard Hughes program).

BOARD I SCANNING ELECTRON MICROSCOPY OF A TREMATODE, COTYLOGASTER OCCIDENTALIS. FOUND IN FRESHWATER MUSSELS COLLECTED FROM HEAD WATERS OF THE CUYAHOGA RIVER. THOMAS B. COLE AND MARTIN K. HUEHNER, DEPT. OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.

Freshwater mussels were collected from the head waters of the Cuyahoga River in Geauga and Portage counties, Ohio. Trematodes approximately 2.5mm in length were dissected from the digestive tract of the mussels, rinsed and placed in isotonic saline at 4°C. The collected specimens were then fixed for 4 hours at 4°C in 2.5% gluteraldehyde. The fixative was prepared with 0.1M Sorensen's phosphate buffer pH 7.2 with 0.1gm sucrose per 10cc of fixative. After primary fixation the specimens were rinsed in fresh buffer at 4°C and post-fixed for 1.5 hours in buffered 2% osmium tetroxide. Following post-fixation the specimens were thoroughly rinsed with fresh buffer and placed in 70% ethyl alcohol. The fixed specimens were then dehydrated to 100% with a series of increasing percentages of ethyl alcohol. Alcohol dehydrated specimens were critical point dried (CPD) with liquid carbon dioxide. The CPD specimens were mounted on aluminum stubs with silver paint and sputter coated with pallidium. Observations at low magnifications revealed trematodes that were elongate with the mouth located at the anterior end. The mouth was surrounded by a well defined triangular shaped oral disc. An elevated oral cone with attached debris, perhaps cellular debris from the host, was occasionally observed within the oral disc. Most of the trematode was seen as a well-developed posteroventral holdfast organ about 5/6 as long as the body. This organ was subdivided by at least 15 longitudinal rows of sucker-like areas called transverse alveoli. These centrally placed transverse alveoli were surrounded by approximately 50 small sucker-like marginal alveoli. Prominent single marginal organ papillae were located at the lateral corners of each rectangular shaped marginal alveoli. An opening to a marginal organ was observed at the apex of each papillae. In addition, numerous small elevated uniciliate sensory papillae were observed along the boundaries of the marginal alveoli. The dorsal surface of the trematodes proved unremarkable except for a single posterior elevation displaying openings to excretory organs. (This study was supported by the Howard Hughes Medical Institute.)

BOARD J PURIFICATION AND FURTHER CHARACTERIZATION OF THE CYC8-TUP1 PROTEIN COMPLEX IN *SACCHAROMYCES CEREVISIAE*. PHILIP B. MIKESELL, USHASRI VARANASI, ROBERT J. TRUMBLY, MEDICAL COLLEGE OF OHIO, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, PO BOX 10008, TOLEDO OH 43699-0008.

The CYC8-TUP1 protein complex in the yeast *Saccharomyces cerevisiae*, which functions as a transcriptional regulator, has been studied extensively by mutational analysis and other genetic methods of analysis. Purification of the complex will facilitate in vitro functional studies and a wide range of other biochemical methods for further analysis of the nature of the complex. Recently, using a six-histidine residue tag on the N-terminus of CYC8, the complex has been partially purified using affinity purification with nickel resin. Further improvements in the purification protocol should allow the complete purification of the complex. Also being further elucidated are the molecular parameters of the CYC8-TUP1 complex. It has been shown that the complex has an apparent size of 1200 kDa, raising the possibility of associated proteins. However, immunoprecipitation results revealed that the complex is composed only of CYC8 and TUP1 oligomers. Attempts are being made to identify the number of subunits by determining the sizes of the proteins using a combination of density gradient centrifugation and gel filtration with the mutant and full-length TUP1 proteins.

BOARD K CANINE DIHYDROLIPOAMIDE DEHYDROGENASE: CLONING AND GENE EXPRESSION. AMY MILSTED AND ALMIR S. MARTINS, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44235-3908.

Dihydrolipoamide dehydrogenase (DL) is an enzyme that is present as a common component of mammalian multisubunit α-ketoacid dehydrogenase complexes (including pyruvate dehydrogenase) and the glycine cleavage system. Our objective was to obtain a full length cDNA clone encoding this enzyme in the dog for use in studies of regulation of DL expression. We isolated a partial clone from a canine skeletal muscle cDNA library. To obtain the 5'-end of the cDNA we used the technique of anchored polymerase chain reaction (PCR) to amplify poly (A)+ RNA from dog brain. The full-length sequence of the dog cDNA is 96% homologous to the human DL enzyme at the nucleotide level and 98% homologous at level of deduced amino acid sequence. We identified four sites in the 3'-untranslated region of the dog cDNA clone that are potential signals for poly (A)+ adenylation. The mRNA encoding DL is expressed and regulated in two cultured cell lines. In MDCK cells, a non-transformed line derived from dog kidney, the mRNA is abundant and is regulated by cAMP, phorbol ester and dexamethasone. DL mRNA is less abundant in a transformed canine cell line, D-17, derived from an osteogenic sarcoma. Further studies will examine mechanisms of regulation of expression of the DL gene in the cultured cell lines.

BOARD L SPATIAL DISTRIBUTION OF EXU PROTEIN IN *DROSOPHILA* NURSE CELLS. ANNALISA M. VAN HOOK AND DAVID J. MARCEY, BIOLOGY DEPT., KENYON COLLEGE, GAMBIER OH 43022.

Exuperantia protein and bicoid (bcd) mRNA are produced in *Drosophila* nurse cells and move into the oocyte during early stages of oogenesis. Bcd mRNA is localized in the anterior tip of the oocyte, an event in which exu is essential. Exu is responsible for altering either the (1) mRNA or (2) its molecular anchor in the oocyte. If the spatial distributions of these molecules within the nurse cells are the same, then a direct relationship between the mRNA and the protein is implied, thus supporting the first hypothesis. In this study, we aim to identify the distribution pattern of exu protein, specifically whether it is apical of perinuclear. Ovarian tissue samples were fixed, embedded, sectioned, immunostained, and examined by light and electron

microscopy (LM and EM). Immunostaining utilized 1° rat α-exu and either 2° goat α-rat, AP conjugated (LM), or 2° goat α-rat, colloidal gold conjugated (EM). Tissue was stained after sectioning rather than as whole mounts to avoid permeation problems. Preliminary LM studies show that exu is not distributed apically, but it is still unclear whether or not it is perinuclearly distributed. EM studies are now in progress and are expected to elucidate the pattern of exu distribution.

BOARD M EXPRESSION OF AMPHIREGULIN IN HUMAN COLON CARCINOMA CELL LINES. SHENGCHUN YE, SUDHAKAR AMMANAMACHI, SRINIVAS VENTAKATESWARLU, YONG KO AND MICHAEL G. BRATTAIN, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Amphiregulin (AR) is a novel growth factor which belongs to the epidermal growth factor (EGF) gene family. It is a glycosylated single chain polypeptide of 78 or 84 AA which has high homology to EGF and transforming growth factor (TGF)-α. AR appears to function in the regulation of tumor progression and differentiation. This study was undertaken to examine AR mRNA expression and its possible relationship with other EGF-related peptides in the tumor development. By reverse transcriptase polymerase chain reaction, a 1024 bp AR cDNA was synthesized from GEO colon carcinoma cellular mRNA. A 219 base probe was developed for RNase protection assay to determine the level of AR mRNA expression in colon cancer cells. HCT116 cells transfected with TGF-α antisense cDNA had significantly lower AR levels than nontransfected cells. These cells also had lower EGF receptor and TGF-α mRNA levels than the nontransfected cells. This suggests that AR may be moderated by TGF-α or vice versa. Currently, studies are in progress to examine the mechanism of action of AR in the regulation of colon cancer cell growth, differentiation and tumorigenicity.

BOARD N DNA MARKERS OF FLOODING TOLERANCE IN SOYBEAN. TARA T. VANTOAI, JIANHUAN ZHANG, STEPHEN K. ST. MARTIN, AND SHU-WEN YU. USDA-ARS, SOIL DRAINAGE RESEARCH, 590 WOODY HAYES DR., COLUMBUS OH 43210.

Soybean has been known for its relative lack of polymorphism. This study was conducted to determine the use of RAPD markers to map the flood tolerant loci in soybean. The flooding tolerance of Chinese and U.S. soybeans was determined by both field and simulated laboratory screening tests. Among the Chinese germplasm, Baimongjie showed similar flooding tolerance with Williams and Williams 82 (66% survival), Xu 89-2 showed the highest flooding tolerance at 84% survival, and Dabingchin, the lowest tolerance at 14% survival. Template DNA was extracted from soybean leaves using a fast and simple method. Of the 100 oligonucleotide primers screened, 71 produced DNA fragments. However, polymorphism was only detected in the products of 62 primers. Since a total of 141 polymorphic bands were detected, the ratio of polymorphic band/primer was 1.99. DNA templates extracted by different methods, from different plant organs which were either flooded or not flooded produced consistent RAPD fingerprints. The reproducibility of this technique is close to 100% even on minor DNA bands. Crosses between flood-tolerant and -susceptible soybeans were made to map the flooding tolerance genes in the segregating population.

BOARD O INSULIN IN THE RAT STOMACH AND COLON. G. COLIN BUDD, BEN PANSKY AND MURRAY SAFFRAN, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

The possible presence of insulin in the mammalian gastrointestinal tract (GI) has been ignored. Insulin receptors on the mucosal side of the colon, the production of the other major pancreatic islet hormone, glucagon, by the gut, and its suppression by intra-GI insulin in pancreatectomized dogs, all suggest that insulin is a paracrine agent in the control of glucagon secretion from the same or neighboring GI cells. Can the GI tract synthesize insulin? To search for GI insulin, freshly-excised rat GI tissue was used (1) to demonstrate the presence of immunoreactive insulin in gastric and colonic epithelia by immunocytochemistry, using antisera specific for porcine insulin, (2) to show the presence in the same cells of preproinsulin mRNA with in situ hybridization histochemistry, using specific oligonucleotide probes, (3) to confirm the identity of preproinsulin mRNA by reverse transcription to cDNA and combined reverse transcription and polymerase chain reaction amplification with specific primers for rat preproinsulin DNA to obtain enough cDNA to sequence, and (4) to show that the sequence is that of the coding region of rat pancreatic preproinsulin mRNA. The small intestine does not contain either immunoreactive insulin or preproinsulin RNA. Conclusion: Epithelial cells in the rat stomach and colon appear to synthesize preproinsulin mRNA and immunoreactive insulin. Support by Defiance Area Diabetes Club.

BOARD P EFFECTS OF CO_2 ENRICHMENT AND OZONE ON THE GROWTH AND GAS EXCHANGE OF DUCK WEEDS. SARAH BAILEY, KEN LOATS, AND JOANNE REBBECK, DEPT. OF BIOLOGY, DENISON UNIVERSITY, GRANVILLE OH 43023.

Physiological responses of *Lemna minor* and *Spirodela polyrhiza* to projected increases in atmospheric CO_2 and to near ambient levels of ozone (O_3) were evaluated. The duck weeds were cultured on a chemically defined medium and placed in five outdoor, open-top chamber treatments: (1) charcoal filtered air and ambient CO_2; (2) ambient O_3 and ambient CO_2; (3) twice ambient O_3 and ambient CO_2; (4) twice ambient O_3 and twice ambient CO_2; or (5) open air. Growth was significantly inhibited by twice ambient O_3 in *L. minor* but not in *S. polyrhiza*. Elevated CO_2 enhanced the growth of both duck weeds in the presence of twice ambient O_3. To determine if gas exchange rates were factors that contributed to growth responses, we measured net photosynthesis and dark respiration rates at the end of the three week fumigation period. In a second experiment, the effects of CO_2 enrichment on photorespiration, net photosynthesis, and dark respiration were examined under controlled environmental conditions. Comparisons of gas exchange rates for the duck weeds studied will be presented.

BOARD Q CONSTRUCTION OF CHIMERIC BETA-LATENCY-ASSOCIATED PEPTIDES. YANHONG WU, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Transforming growth factor βs (TGF-βs) are proteolytically derived from the carboxyl-terminus of a 390 amino acid precursor molecule termed pre-pro-TGF-βs. The pro from, called X-latency-associated peptide (β-LAP), plays an important role in the formation of an inactive latent complex. These latent forms are important in the regulation of TGF-β activity. To understand the structural and functional regulation of these latent complexes, we plan to construct a series of chimeric β-LAP, containing an original sequence from TGF-β1 and sequences from TGF-β2 and/or TGF-β3. The constructions will be defined by relative sequence homology. Following chimera construction, the cDNAs are shuttled from pOM-1 into the expression vector pCDNA1 and expressed in COS-1 cells. Expressed proteins will be monitored by immunoblotting and functional activity of these pro-domain chimeras will be assessed by bioassay. We have prepared one such mutant in pCDNA1 expression vector and its results will be presented. The data from these studies should provide chimeric reagents for investigating different modes of latent activation.

BOARD R RESPONSES BY ADULT NITIDULIDAE (COLEOPTERA) TO SYNTHETIC AGGREGATION PHEROMONES IN COMBINATION WITH WHOLE WHEAT BREAD DOUGH. R.N. WILLIAMS, D.S. FICKLE, AND M.S. ELLIS, DEPT. OF ENTOMOLOGY, OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER OF OHIO STATE UNIVERSITY, 1680 MADISON AVE., WOOSTER OH 44691.

Aggregation pheromones for seven *Carpophilus* (Nitidulidae) species were field tested at the Moreland Fruit Farm during the summer of 1993. The specific pheromones used were: *Carpophilus antiquus* (Melsheimer), C. brachypterus (Say), *C. freemani* Dobson, *C. hemipterus* (L.), *C. lugubris* Murray, *C. mutilatus* Erichson, and *C. obsoletus* Erichson. Each pheromone was used in conjunction with whole wheat bread dough, an effective coattractant. These seven treatments along with the control (whole wheat bread dough without pheromone) were tested for attractiveness. In addition, crossattraction among pheromones was noted. All species responded very favorably to their own pheromone, with the exception of *C. obsoletus*, which was apparently not present in this area. The strongest crossattraction occurred between *C. brachypterus* and *C. hemipterus*, where, on two occasions, these species responded better to pheromone of the other species. *C. antiquus* also showed some attraction to the C. lugubris pheromone. Other nitidulids such as *Stelidota geminata* (Say), *Glischrochilus fasciatus* Olivier, and *G. quadrisignatus* (Say) were also taken in large numbers. The latter three were responding, not to pheromones, but to the bread dough in the traps.

BOARD S SURVEY OF INSECTS IN THE KILLBUCK MARSH WILDLIFE AREA. R.N. WILLIAMS, D.S. FICKLE, M.S. ELLIS AND F. PURRINGTON, DEPT. OF ENTOMOLOGY, OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER OF OHIO STATE UNIVERSITY, 1680 MADISON AVE., WOOSTER OH 44691.

The Killbuck Marsh Wildlife Area was the focus of a seven month survey performed in 1993 to determine the diversity of selected insects. Primary emphasis was focused on three families of Coleoptera: ground/tiger beetles (Carabidae), the sap beetles (Nitidulidae), and carrion beetles (Silphidae). Special care was taken to determine if any rare or endangered species were collected within these families. In addition to these families, 35 other families of Coleoptera composed of over 200 species were collected and identified. Several trapping methods were utilized at five different sites within the Killbuck Marsh. These included: ultraviolet (black light) traps, flight interception (window) traps, bait traps, carrion bait sampling, and sweep netting. Aside from Coleoptera, several dragonflies/damselflies (Odonata), caddisflies (Trichoptera), butterflies/moths (Lepidoptera), and mosquitoes/midges (Diptera) were also taken. In all, 56 species of ground beetles (Carabidae), 30 species of sap beetles (Nitidulidae), and seven species of carrion beetles (Silphidae) were identified. Five species of ground beetles (Carabidae) which are considered uncommon were encountered. They were: *Agonum cupripenne* (Say), *Agonum galvestonicum* Casey, *Chlaenius niger* Randall, *Oodes americanum* Dejean, and *Stenocrepis cuprea* (Chauvoir).

POSTER SESSION
10:00 AM, Saturday, April 23, 1994
Dana-Hilton Connector

BOARD A THE EFFECTS OF ANTIOXIDANTS ON THE LIFE SPAN OF *DROSOPHILA MELANOGASTER*. JEFFERY M. MCGRATH, 2730 NANTUCKET RD., BEAVERCREEK OH 45434.

Finding a way to slow the process of aging in humans must first be tested through the use of animals or insects. If the retarding of the process of aging could be achieved, there could be a major change in the life style of humans. The problem of this project was to determine, through the use of antioxidants, if the process of aging of *Drosophila melanogaster* could be slowed. The antioxidants that were used were the herbs rosemary, sage, thyme, oregano, cloves, and the preservative Ever Fresh. One gram of the antioxidant was mixed with one-hundred milliliters of water. This solution was mixed with the *Drosophila* medium, replacing the ordinary water used to make the control medium. The hypothesis of this experiment was that the antioxidant would

have the effect of extending the life span of the *Drosophila melanogaster.* The results of the experiment have, so far, proven that the hypothesis was correct. In the vials containing the control, it took an average of nine days for the pupa to be seen. The average length of time it took the pupa to be visible in the vials containing the antioxidants was eleven days. The flies generated from the pupa in the control group will determine the length of the life span of the control fruit flies. This life span will be compared to the life span of the fruit flies generated from the pupa of the vials containing the antioxidants. After this comparison is made, a final conclusion will be drawn.

BOARD B EFFECT OF THE WTSN GENE ON THE PATHOGENICITY OF *ERWINIA STEWARTII.* ELIZABETH H. STOVER, 2140 LANE RD., COLUMBUS OH 43220-3012.

Erwinia stewartii is a phytopathogenic bacterium which causes the disease Stewart's Wilt in sweet corn (*Zea mays*). The purpose of this experiment was to discover how the wtsN gene affects the pathogenicity of *E. stewartii* in corn. Four strains of *E. stewartii* were constructed, each with different copy numbers of the wtsN gene. These strains were inoculated into corn plants at four different cell concentrations, and three different aspects of pathogenicity were investigated: infectivity, response time, and disease severity. The results showed no statistically significant differences among the strains in infectivity, response time, or disease severity caused by *E.stewartii.* However, separate experiments showed that the strains clearly differed in their ability to cause the hypersensitive response, a plant defense response, in tobacco. The data supported the conclusion that the wtsN gene has no effect on the pathogenicity of *E. stewartii* in sweet corn, although it does affect the ability of the bacteria to elicit the hypersensitive response. This information contributes to the understanding of Stewart's Wilt, one of the most serious diseases of sweet corn in the United States. The data is also helpful in the study of the relationship between wts genes in *E. stewartii* and hrp genes in several other phytopathogenic bacteria.

BOARD C THE EFFECTS OF VARIABLE TIME DURATIONS OF ULTRASOUND AND VARYING LEVELS OF IONIZING RADIATION ON *ESCHERICHIA COLI, BACILLUS MEGATERIUM,* AND *SERRATIA MARCESANS.* ALEXANDER J. SEIDENSTICKER, 4 SHAWNEE DR., CHILLICOTHE OH 45601.

This study is to determine the effects of ultrasound and varying levels of ionizing radiation from a Cobalt-60 source on *Escherichia coli, Bacillus megaterium,* and *Serratia marcesans.* Cultures of each bacteria will be exposed to radiation and ultrasound. The growth of the cultures will be looked at in every bacteria, but solely for the *E. coli. Serratia marcesans* will be looked at to determine whether the radiation or ultrasound effected the pigment which is red at room temperature. Cell morphology will be studied in the *Bacillus megaterium.* The ultrasound will be exposed to the bacteria in different lengths of time, while the radiation will be given at different dosages; 100 rads, 250 rads, 500 rads, and 1000 rads. This study will the effects that ultrasound and radiation may have in the human body.

BOARD D LETHAL MUTATION: THE EFFECTS OF PESTICIDES ON FRUIT FLIES. SOLOMON G. ZARAA, 470 N. REVERE RD., FAIRLAWN OH 44333.

This experiment is to determine whether lethal mutation occurs in fruit flies, *Drosophila melanogastor,* feeding on apples sprayed with pesticides. Experimentation showed that there is an average of 20% less F2 generation in apples sprayed with pesticides when compared to organically grown apples.

BOARD E LOSS OF GAP JUNCTIONS IN RAT LIVER EPITHELIAL CELLS TREATED WITH TUMOR PROMOTERS. WILLIAM J. BONNEY AND RANDALL J. RUCH, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Many tumor promoters reduce gap junctional intercellular communication (GJIC) and this effect may be involved in the promotion mechanism. In this study, we determined whether the inhibition of GJIC by promoters was related to the loss of gap junctions. WB-F344 rat liver epithelial cells were treated with butylated hydroxytoluene (BHT; 10-150 μM), 12-0-tetradecanoylphorbol-13-acetate (TPA; 10 ng/ml), p,p'-dichlorodiphenyltrichloroethane (DDT; 1-10 μM), dieldrin (10 ng/ml), or heptachlor epoxide (10 μg/ml). GJIC was assayed by microinjection of fluorescent Lucifer Yellow CH dye. Gap junction number per cell was quantified lay immunofluorescent staining and counting of the junctions. In control cells, approximately 90-100% of the cells were dye-coupled and 10-15 gap junctions per cell were counted. Treatment with tumor promoters reduced dye-coupling and gap junction number in dose-and time-related fashions. These results suggest that the reduction of GJIC in rat liver epithelial cells by tumor promoters results from the loss of gap junctions. (Supported by NCI-CA57612).

BOARD F EFFECTS OF DIMETHYL SULFOXIDE ON THE REGENERATION OF EARTHWORMS AND PLANARIA. NICOLE S. HAMMOND, 3880 MAPLEVIEW TRAIL, ATWATER OH 44201.

This experiment was conducted to determine if dimethyl sulfoxide (DMSO) assists in the regeneration and repair of tissues. This experiment was divided into two sections. The first section was conducted using *Lumbricus terrestris,* (earthworms). They were divided into two groups. With the first group of 24 earthworms, one inch was removed from the posterior end. Two inches were removed from the posterior end of the second group. The second part of the experiment was performed upon planaria. The first ten planaria were cut in half. The second ten planaria were separated by the tail. Both the planaria and the earthworms received 70% DMSO. Varying dilutions of DMSO in water were used. Results of these experiments showed that DMSO does have an effect on the repair and regeneration of tissues. Of the ten planaria, in which the tails were separated, the five treated with DMSO regenerated at a rate 75% faster than those not treated with DMSO. The five planaria, in which the body was separated, regenerated new bodies 71% faster. Of the 24 earthworms, in which one inch was removed, the twelve treated with DMSO regenerated at a rate 50% faster. The 12 earthworms, in which two inches were removed, regenerated 53% faster. The solutions, which worked the best, were 70% dimethyl sulfoxide and 30% distilled water. With the planaria 35% DMSO and 65% distilled water, showed optimal results.

BOARD G WHICH COMMON HOUSEHOLD METHOD OF FOOD PRESERVATION PRESERVES THE MOST EFFICIENTLY? DANIEL L. MILLER, 51861 S.R. 145, BEALLSVILLE OH 43716.

The research that I have preformed in my in-depth study of household methods of food preservation will prove my hypothesis. I believe that the method of canning will be more efficient than the other two methods, freezing and refrigeration. The experimentation will include three samples of beef broth a day for each of the methods plus a control. The data I collected was the number of bacterial colonies found in the broth, using a 1/100 ml dilution. The numbers of the three samples of the method were averaged to produce the final number. In conclusion, the canning had the lowest bacterial growth over the thirty day period.

BOARD H DO IN-USE BAR SOAPS HARBOR MICROORGANISMS AND CAN TRANSFER OF MICROORGANISMS TO SKIN SURFACES OCCUR DURING HAND WASHING? N. REID PERALA, 600 EASTWOOD ST., GENEVA OH 44041.

To test my hypothesis that washing with in-use bar soaps would result in the transfer of microorganisms from the bars to the skin's surface, I cultured bacteria from the bars and the skin's surface before and after washing with the soaps. I then analyzed the cultured bacteria to determine whether or not it was pathogenic and to identify the microorganisms. Multiple trials were conducted over the life of the bars using strict controls. Cultures were made of microorganisms from the bars and compared with those obtained from the skin. Particular attention was paid to ensure that the sources of contamination and the environment in which the bars were placed were typical of a household as opposed to a hospital or health-care facility where pathogenic bacteria may be found in greater proportions. My research indicated that transfer of pathogenic microorganism to skin surfaces is a probable occurrence if bar soaps are utilized.

BOARD I DO SPECIFIC AMBIENT ODORS ENHANCE LONG-TERM MEMORY? BRETT T. PERALA, 600 EASTWOOD ST., GENEVA OH 44041.

I hypothesized that long-term memory and learning ability would be enhanced when subjects were exposed to the ambient odors of essential natural oil of peppermint, rosemary, and lemon while taking a memory test. My procedure included administering two sets of memory tests to a control group and an experimental group. Both groups were composed of 15/16 year-old high school students homogeneous in intellectual ability and having an adequate sense of smell as demonstrated by their performance on the National Geographic Smell Survey. In Trial 1, the experimental group was tested in the presence of the ambient odor while the control group was tested with no odor present. In Trial 2, both groups were tested while in the presence of the ambient odor. My hypothesis was supported by the results of the experiment as follows: In Trial 1, the experimental group performed better than the control group. In Trial 2, the control group greatly improved their scores. I concluded that, as demonstrated by my experiment, exposing test takers to a specific ambient odor does have a measurable positive effect on long-term memory.

BOARD J STATISTICS OF BACKGROUND RADIATION. DEVEN S. KOTHARI. 6619 WILLOWOOD DR., MAUMEE OH 43537.

The purpose of this project is to determine whether background radiation follows a statistical pattern. Specific time intervals will be chosen, e.g. 5 min., 2 min., 1 min., .5 min., .2 min., and .1 min. The amount of radiation which occurs during those time intervals will be measured with a Geiger counter 100 times. The mean and standard deviations will be calculated for this data. A plot of the number of counts per time interval versus the number of times that the number of counts occurs will be made to determine whether a normal statistical curve exists for each time interval.

BOARD K FREQUENT STUDENT-TO-FACULTY FEEDBACK OFFERS OPPORTUNITIES FOR MID-COURSE CORRECTIONS. MURRAY SAFFRAN, PHILIP B. CONRAN, AND DAVID A. LACHER, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Usual student evaluation of teaching is by individually-answered anonymous questionnaires on a 5-point scale at the end of a course. Drawbacks include a variable rate of return, too little detail for correction, irresponsible comments, and receipt of the information too late for correction. To overcome these problems, a new feedback system was field-tested in second year courses in Pathology and Medical Decision Making to provide frequent feedback from students to course directors on the course and the individual instructors. The class of 141 students was divided randomly into 13 groups of 11 students. Each group was briefed by one of us (M.S.) on the purpose and process of the feedback. The group attended all lectures, laboratory and small group sessions for an assigned period of 2 weeks and kept notes on every instructor, and on the course content and organization. Input from other students in the class was welcomed. At the end of the 2-week period, the group wrote combined narrative reports on each instructor and on the course. The reports were signed and given to the course directors within the following week. The Associate Dean for Student Affairs placed a note into the files of

each participating student for later use in writing the Dean's letter. The students and course directors found the feedback to be useful in evaluation and improvement during the course. Students and course directors in other courses requested that the feedback be extended. Some non-participating faculty objected that the groups were too small for valid evaluation and that the narrative form of the report does not permit easy statistical analysis. A few students complained that they were forced to attend classes in courses in which attendance was not compulsory. Another student complaint was that the "load" was uneven because pathology had more classes per week than the Medical Decision Making course. There were no objections from the faculty in the two courses. A modified form of the feedback system is now applied to all the basic science courses and extension to the clerkships is being studied.

BOARD L LINGUAL THRESHOLD RESPONSES IN ARTICULATION DEFECTIVE CHILDREN. LINDA PETROSINO, DONALD FUCCI, GAIL UNDERWOOD. DEPT. COMMUNICATION DISORDERS, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

This study was designed to investigate possible differences in tactile sensory system function between a group of normal speaking children (M age = 7.8 yr.) and a group of children with articulation problems (M age = 7.5 yr.). This task was accomplished by studying tactile threshold shifts occurring during magnitude estimation scaling of vibratory stimuli presented to the tongue. For the scaling task, the children with articulation problems showed higher mean magnitude estimation responses than normal speaking children. Threshold shift occurred for both group of subjects for all suprathreshold intensities employed. Differences occurred in threshold shift between the normal speaking children and those with an articulation problem. Findings suggest that a difference exists between children with articulation defects and normal speaking children in terms of oral sensory system responsiveness to suprathreshold vibratory stimulus intensities. The data indicate that the oral sensory mechanisms of children with articulation problems are operating differently than those of normal speaking children.

BOARD M TIME SERIES ANALYSIS OF EXTREME MINIMUM WINTER TEMPERATURES AT SANDUSKY, OHIO. DENNIS J. EDGELL AND ROLANDO SANTOS, BOWLING GREEN STATE UNIVERSITY -FIRELANDS COLLEGE, 901 RYE BEACH RD., HURON OH 44839.

The Extreme Minimum Winter Temperature (EMWT) is the lowest daily minimum temperature recorded at a given weather station each winter. This climatic parameter is useful as a measure of winter temperature stress. The coldest temperature of the winter influences the geographic distribution of plants, especially horticultural species and fruit crops. Average EMWT values are often used to map plant hardiness zones, but these zones may change if the EMWT changes over time. Sandusky, Ohio is located along Lake Erie's fruit belt. EMWTs there are generally mild in comparison to the rest of Ohio, however the magnitude of the EMWT varies widely from winter to winter. Furthermore, if global warming is occurring, fruit and ornamental species could be grown at locations further from the lake. Thus, a more lucrative fruit industry is one arguable benefit of global warming! This paper assesses the trend of the EMWT at Sandusky, Ohio in the context of potential climate change. Summary statistics and return period intervals for EMWT are tabulated and presented. Time series methods are used to examine the long term trend since 1883. Graphical plotting methods, moving averages, forecasting and curve fitting are utilized. Autocorrelation analysis and stationary testing are also utilized to determine the nature of the data trend.

BOARD N THE BEDROCK GEOLOGY OF THE OHIO PORTION OF THE PIQUA 30 X 60 MINUTE QUADRANGLE. GREGORY A. SCHUMACHER, ODNR, DIVISION OF GEOLOGICAL SURVEY, 4383 FOUNTAIN SQUARE DR., COLUMBUS OH 43224.

The Piqua 30 x 60 minute bedrock geologic quadrangle, located in west-central Ohio, is the first of a series to be released as part of the cooperative effort between the Ohio Department of Natural Resources, Division of Geological Survey and the U.S. Geological Survey to remap the bedrock geology of Ohio. The Piqua geologic map shows the contacts between six separate rock units of Ordovician and Silurian age and the distribution of the ancient Teays River valley, tributaries, and drainage divides. The publication also provides a concise discussion of the mapping methods; geologic setting; and bedrock, economic, and environmental geology. In addition, open-file mapping products are available for the area of the Piqua 30 x 60 minute quadrangle, including (1) the glacial geology of the region at a scale of 1:250,000, (2) computer-generated structure-contour maps for the top of each mapped unit at scales of 1:250,000 and 1:24,000, (3) bedrock topography maps at a scale of 1:24,000, and (4) a summary of the changes in stratigraphic nomenclature over the last 150 years. The Piqua 30 x 60 minute bedrock geologic quadrangle and associated open-file products will help the citizens of Ohio plan the development and utilization of the land and its mineral resources, ground water, and fossil fuels in a manner that achieves environmental balance and minimizes the impact of geologic hazards.

BOARD O DESIGN PRINCIPLES FOR DEVELOPING USER-FRIENDLY GRAPHICAL USER INTERFACES. SUMANTH MADIMSETTY, DEPT. OF COMPUTER SCIENCE AND ENGINEERING, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

It is not often that we find a software application without a graphical user interface (GUI). A GUI is defined as an interface which operates on windowing environments, has pull down menus and can be controlled by a mouse. It is widely accepted fact that GUI's are much more convenient to use than command level interfaces. However, it has been noticed that the GUI's that are being developed of late are in many ways overwhelming. In an attempt to achieve higher functionality, designers have complicated the layout of the GUI's: thus making the interface more difficult to use. To put it in word, the GUI's have become less user-friendly. This paper brings out design principles which can be used to develop user-friendly and easy to use GUI's. User-Testing has been performed on several software packages to find out specific areas where users tend to commit more errors and also isolate specific tasks which users find difficult to complete. A formula to assess relative usability and give numeric grading to these interfaces is also developed. Through user testing I have developed data that suggests specific design principles, which could be used by designers to design user-friendly GUI's.

POSTER SESSION
02:00 PM, Saturday, April 23, 1994
Dana-Hilton Connector

BOARD A WOOD DENSIFICATION. ROBERT L. ROMIG, GREG P. GORDON. SCHOOL OF NATURAL RESOURCES, OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, 1680 MADISON AVE., WOOSTER OH 44691.

A low cost prototype wood densification machine has been designed and constructed using compacting ram technology. The machine produces a briquette from solid wood waste generated by secondary wood manufacturing companies. The prototype machine is capable of producing a briquette four inches in diameter and approximately four inches thick using hydraulic pressure only (no binders). The briquettes were evaluated for durability, density and heat value. Briquette quality was also evaluated based on raw material moisture contents particle size, species and compaction pressure. Briquettes made with higher compaction pressures had greater durability. Raw material moisture content was the most sensitive variable evaluated. Critical raw material moisture content ranged between seven percent and eighteen percent (dry weight basis). Briquettes made from raw material outside the critical range resulted in low durability and low heat value. Briquette durability was not effected by raw material particle size or wood species. Briquette density was dependent on compaction pressure and particle size.

BOARD B LONG-TERM EFFECTS OF ENRICHED CARBON DIOXIDE (CO_2) AND OZONE (O_3) ATMOSPHERES ON ELM LEAF BEETLE (ELB) PERFORMANCE. J. H. BARGER, W. N. CANNON, JR., USDA FOREST SERV., 359 MAIN RD., DELAWARE OH 43015; AND R. W. HALL, DEPT. ENTOMOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

The effects of doubling atmospheric CO_2 during the next century, in the presence of other pollutants (0_3), may alter insect/host-plant interactions causing an increase in frequency and severity of pest outbreaks. Elm trees were fumigated with either ambient air (AA) at 1X, enriched CO_2 at 2X or 0_3 at 2X, or both (2X), in open-top chambers for 1992-93. Cumulative seasonal 0_3 doses for 1992 and (1993) were 95 (116), 97 (118), 148 (199), 157 (196) ppm.hr and CO_2 doses were 1061 (1270), 1895 (2252), 1038 (1270), and 1929 (2227) ppm.hr for AA, $C0_2$, 0_3, and $0_3 + CO_2$, respectively. Assays were conducted on leaf tissue for nitrogen and H_2O content. ELB bioassays were conducted in petri dishes for leaf area consumed, fecundity, and mortality and in insect cages on elm branches for fecundity. Experiments corresponded to two ELB generations each year. For both years, elms fumigated with CO_2 and CO_2 plus 0_3 had significant decreases in nitrogen and H_2O content. In 1992, elm growth increased for CO_2 and CO_2 plus 0_3 but was unaffected in 1993. Leaf area consumed and fecundity of ELB varied between years. Leaf ethylene evolution and ELB mortality were unaffected. Findings will provide basis for regional/national management and policy decisions regarding forest ecosystems and global change.

BOARD C APPLICATION OF THE INDEX OF BIOTIC INTEGRITY TO BUCK CREEK AND MILL RUN, CLARK COUNTY, OHIO. ALISA A. ABOOKIRE, GREGORY C. ANTEMANN, AND JOSH HUTSON, DEPT. OF BIOLOGY, WITTENBERG UNIVERSITY, P.O. BOX 720, SPRINGFIELD OH 45501-0720.

Sections of Buck Creek downstream from C.J. Brown Reservoir and one of its tributaries, Mill Run, in Clark County were sampled by electroshocking beginning in the fall of 1993 in order to assess the biotic integrity of these lotic systems. Criteria for site determination were current velocity, water depth and location from pollution sources. Buck Creek sites were chosen in relation to the confluence of Mill Run and Buck Creek. Those on Mill Run were upstream and downstream of a known industrial pollutant effluent. Physicochemical parameters were measured at each site and remained relatively consistent between localities. Index of Biotic Integrity (IBI) values were assigned for each site and used in conjunction with species diversity and similarity indices. Results show that pollution in Mill Run has a detrimental effect on downstream fish communities, and IBI and Species richness values are higher in those locations upstream from point-source inputs.

BOARD D AN EXAMINATION OF THE DISTRIBUTION OF TRYPANOSOMES IN WHITE-FOOTED MICE AT THE J.H. BARROW FIELD STATION IN NORTHEAST OHIO. PATRICIA A. WALUNIS AND MARY BENNINGER-TRUAX, BIOLOGY DEPT., HIRAM COLLEGE, HIRAM OH 44234.

We attempted to examine the relationship between the density and distribution of the white-footed mouse (*Peromyscus leucopus*) and the distribution of the blood parasites, *Trypanosoma musculi* and *Trypanosoma lewisi* at Hiram College's J.H. Barrow Field Station. Three live-trapping sites were established in a late-successional beech-maple forest, and one site was established in a 25-year old-field. Nest boxes were also constructed and placed in a variety of woody habitats. The traps and nest boxes were checked twice-weekly from 18 June through 2 October, 1993. A drop of blood was taken from the tail of each captured animal, and

identification number, body mass, reproductive condition, and capture location were recorded. Blood smears were stained and examined using a compound microscope. A total of 35 individuals were captured, but no trypanosomes were observed in the blood smears. We are currently examining possible reasons for the lack of trypanosomes, as they were commonly found in mice captured at the J.H. Barrow Field Station several years ago. This research was supported by funds from the Howard Hughes Medical Institute.

BOARD E INDUCTION OF TAXOL IN *TAXUS MEDIA* CV HICKSII. **TODD P. EGAN, NEIL D. DANIELSON, AND DAVID L. GORCHOV, BOTANY DEPT., MIAMI UNIVERSITY, OXFORD OH 45056-1176.**

A major limitation with the anti-cancer drug taxol is that it is found in minuscule quantities in the bark and needles of yews. Because *Taxus* extracts have anti-herbivore properties, and it has been shown that simulated herbivore damage increases levels of other terpenes, we hypothesized that herbivory may induce higher levels of taxanes (e.g. taxol and baccatin III). To test this hypothesis insect herbivory was simulated by cutting into the bark of 2 yr old *Taxus media* cv *hicksii* 1 mm deep at 5 mm intervals. In a second treatment a 0.1 concentration of 2,4-D in lanolin was applied to the bark, which was then cut with a razor as above. A control group was left unmanipulated. Extraction procedure followed Auriola, Lepisto, and Naaranlahti (1992) and quantification of taxanes was accomplished using an HPLC. We found that cutting significantly increased bark taxol concentrations, but cutting plus 2,4-D resulted in concentrations not significantly different than the control. Baccatin III was not significantly affected by cutting but was reduced by 2,4-D application.

BOARD F MICROBIAL FLORA ON BIRDS: COLONIZATION OF NESTLINGS. **JENNIFER L. FUSSMAN, DEPT. OF ZOOLOGY, OHIO WESLEYAN UNIVERSITY, DELAWARE OH 43015.**

The microbial flora of birds is poorly described and bacterial colonization of nestling is unknown. I collected bacterial samples from nestling tree swallows (*Tachycineta bicolor*) and eastern bluebirds (*Sialia sialis*) from hatching through fledging. I also sampled nesting adults of both species, independent fledgling tree swallows, and nests of both species. Newly hatched nestlings had very few bacteria until the feathers emerged, when the bacterial count increased dramatically. The favorable microclimate created by increased body temperature due to developing thermoregulation probably accounts for the increase in bacteria. The most common bacteria on nestlings were cocci, whereas spore-forming rods were most common on adults and nest material. This suggests that the growth of some bacteria may be inhibited on nestlings. (Supported by the Ohio Wesleyan University/Howard Hughes program).

BOARD G RESPONSE OF GYPSY MOTH LARVAE TO MULTI-YEAR EXPOSURE OF WHITE OAK TO CO_2-ENRICHED ATMOSPHERE. **W. N. CANNON, JR., J. H. BARGER, USDA FOREST SERV., 359 MAIN ROAD., DELAWARE OH 43015; AND R. W. HALL, DEPT. OF ENTOMOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.**

Elevated CO_2 levels may alter foliage qualities that affect insect herbivore food consumption and growth. We evaluated gypsy moth (*Lymantria dispar* L.) pupal weight after the larvae (from the 2nd instar on) had completed their development on foliage of 8-yr-old white oak (*Quercus alba* L.) trees fumigated from May to Oct. 1992 and from May until pupation in July 1993. Fumigation treatments were ambient air or ambient air plus 2X ambient concentration (ca. 650 ppm) of CO_2. Each year, leaf water and total nitrogen content were determined for each tree at the time of pupation and related to pupal weight. For both years, we found that leaf nitrogen and water contents per unit of leaf dry weight were significantly less in elevated CO_2-treated foliage. Nitrogen content was reduced ca. 15% and water content was reduced ca. 4% under this treatment. Gypsy moth pupal weight for both sexes was similar for the ambient and elevated CO_2 treatments, although variability was greater in 1993, the second year of this study. We concluded that the larvae were able to compensate for differences in leaf nutritional factors produced by these treatments.

BOARD H EFFECTS OF DIAZINON ON MACROPHAGES OF KIDNEY AND SPLEEN OF BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS. **NAGEEN QADRI AND HIRAN M. DUTTA, DEPT. OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.**

Effect of diazinon on the macrophages of the spleen and kidney were investigated in the bluegill sunfish, Lepomis macrochirus. A total of 12 bluegills were used; two from each concentration of 15, 30, 45, 60, and 75 µg/L. Duration of exposure was 24 hr. A control of 10 fish were maintained in the same environment without diazinon. After 24 hr. fish were narcotized with MS222, then the kidney and spleen were removed. The tissues were tapped onto separate microscopic slides and fixed using Perl's method for ferric ion staining for macrophages. The fixed slides were then viewed under a light microscope and pictures were taken of the macrophage populations. Kidney in control fish showed one agglutination of .3x.4 cm (normal level); 15 µg/L one agglutination of .5x.4 cm; 30 µg/L 3 clumps averaging 2.6x2.3 cm; 45 µg/L one clump of .7x.8 cm; 60 µg/L one clump of .5x.8 cm; and at 75 µg/L 2 agglutinations averaging 1.0x.85 cm in size. Spleen under control showed 2 clumps averaging .5x.55 cm; 15 µg/L one cluster of .8x1.2 cm; 30 µg/L numerous clusters averaging .36x.43 cm; 45 µg/L 2 clumps averaging .6 x .8 cm; 60 µg/L one cluster of 3.0x2.7 cm; and at 75 µg/L 4 clumps were evident averaging 1.0x.83 cm. Kidney exhibited a steady increase in the macrophage population with the increase in diazinon concentration whereas in the spleen there was an increase in macrophage populations up until 60 µg/L. A decline was evident in the 75 µg/L concentration. This study reveals that the fish's immune system (macrophage population) increases up to a certain level of toxin (60 µg/L diazinon) followed by a decline with the increased level (75 µg/L) of diazinon. This makes the fish susceptible to other diseases, causing eventual death.

BOARD I STRUCTURE AND COMPOSITION OF A BEECH-MAPLE FOREST AT THE JAMES H. BARROW FIELD STATION, HIRAM, OHIO (PORTAGE COUNTY). **LAURA A. SALTER, ALISON M. KELLY, AND MATTHEW H. HILS, DEPT. OF BIOLOGY, HIRAM COLLEGE, HIRAM OH 44234.**

The woody vegetation of a beech-maple forest in northeastern Ohio was quantitatively sampled to determine: species composition and size-class distribution; to confirm the old-growth status of the forest, and to provide baseline data for use in vegetation mapping and for future studies. Importance percentages were determined based on relative frequency, density, and dominance for each woody species (>3 cm dbh), and size-class distributions were determined for each species and for all species combined. For the total forest sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*) are dominant with importance percentages of 32.2 and 18.6, respectively. Major associate species include black cherry (*Prunus serotina*), red maple (*Acer rubrum*), bitternut hickory (*Carya cordiformis*), and white ash (*Fraxinus americana*). Although the inverted J-shape of the size-class-distribution curve suggests old-growth status for the forest as a whole, selected areas deviate somewhat from this pattern. For example, one area, suspected of being an old pasture, is characterized by higher densities of smaller individuals indicating earlier successional status. Another area, in which chestnut (*Castanea dentata*) was previously a major component, is now dominated by red maple, with a large percentage of cucumber magnolia (*Magnolia acuminata*). Bray-Curtis ordination using Euclidean distances supports these observations. We gratefully acknowledge grant support from the Howard Hughes Medical Institute.

BOARD J PRODUCTION AND CHARACTERIZATION OF A MONOCLONAL ANTIBODY PRODUCED AGAINST A TUMORIGENIC HUMAN ESOPHAGEAL CELL LINE, TE-1. **TAO XIN AND ROUDABEH J. JAMASBI, DEPT. OF BIOLOGY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.**

Human esophageal cancer is a very common disease in some areas of China and Africa. Early diagnosis is very critical for successful treatment. At present, there is no efficient method of early detection. In this study, we produced a monoclonal antibody (mAb-6E) against a human esophageal tumor cell line, TE-1, to determine whether it can be used for early detection of this disease. For this purpose, BALB/c mice were immunized with live TE-1 cells as well as with membrane extraction prepared from TE-1 cells. The mAb was produced by fusing myeloma cells, SP2/0, with spleen cells from an immunized BALB/c mouse. Hybridoma producing mAbs were selected after ELISA screening. The mAb was found to be of an IgM subtype. Different levels of antigen expression were detected on different human esophageal cell lines. Immunoflourescence staining of living cells showed that the antigen is membrane-associated. The chemical nature of the antigen is unknown. Treatment of TE-1 cells with lipid solvent, chloroform or methanol, destroyed the antigen-antibody binding capacity. Antigen-antibody binding was also inhibited by periodic acid treatment indicating the glycolipid nature of the antigen. The mAb may be a useful reagent for diagnosis of human esophageal carcinomas.

BOARD K A COMPARISON OF VACCINE-STIMULATED ANTIBODY PRODUCTION AMONG MICE OF DIFFERENT AGES. **PAULA C. MCKINNEY, LINDA MULL YOUNG, LIMA HALL, ADA OH 45810.**

Mice (*Mus musculus*, strain BALB/cByJ) were separated into experimental and control groups aged 2, 3, 4, and 5 weeks. Each animal we injected subcutaneously six times over a twelve day period with 0.05 ml of either saline (controls) or inoculum (experimentals). The inoculum consisted of a 1% solution of ovalbumin (OVA) in sterile saline and was stored at 4 degrees C. Following this immunization regime, the mice were decapitated to obtain blood samples. The samples were collected in citrated tubes, centrifuged to obtain plasma and frozen to prevent enzymatic degradation of any antibodies present. Once thawed, the samples were subjected to a Micro-Ouchterlony test to verify the presence of anti-OVA antibodies. Next a single radial immunodiffusion assay was used to quantify the antibody titre. Comparisons of antibody titres were made between mice of different age groups.

BOARD L ENHANCEMENT OF BONE MARROW NATURAL SUPPRESSOR ACTIVITY AFTER INJECTION OF CIS-DIAMMINEDICHLOROPLATINUM. **ROCCO GEMMA AND JAMES H. HOLDA, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.**

Natural Suppressor (NS) cells are cells that suppress immune responses in a nonspecific manner. They are associated with hematopoietic tissue and tissues susceptible to cytoreductive treatments. Cis-diamminedichloroplatinum (cisplatin, CDDP) is a cytoreductive drug used for the treatment of such cancers as testicular and ovarian. Here we examined NS activity in the bone marrow of C57BL/6 mice after i.p. injection with CDDP. Enhanced activity was apparent 72 hours post injection and returned to normal by day 7. An injection as low as 0.1 mg/kg enhanced BM NS activity. Suppression was shown to be dependent upon IFN-γ, which is characteristic of NS cells. D9C1 supernate was also shown to enhance suppression. Diethyldithocarabamate (DDC), is a common chelating agent that decreases the toxicity of cisplatin. DDC was able to decrease the effect of cisplatin on NS cell activity when the drugs were injected simultaneously. The data suggests that BM NS activity may be influenced in vivo by the chemotherapeutic drug cisplatin. This work was supported by The University of Akron Faculty Research Grant 1184.

BOARD M BONE MARROW NATURAL SUPPRESSOR (NS) CELL ACTIVATION BY LYMPHOKINES INDUCED BY ANTI CD3 ANTIBODY IN

VIVO AND IN VITRO. James Holda, Cindy Horning, Darlene Walro, and Susan Oldfield, Dept. of Biology, University of Akron, Akron OH 44325-3908.

NS cells are found in environments of hematopoiesis and in the spleens of mice after cytoreductive treatments. These cells have been shown to suppress immune responses in a genetically unrestricted and nonspecific manner. Con A induced proliferation (TH-1 cells) is strongly suppressed by NS cells. Suppression requires IFN-γ and can be enhanced by supernate from a TH-2 hybridoma. Here we examined the ability of bone marrow NS cells to suppress anti CD3 induced proliferation (TH-1 and TH-2 cells), and also the ability of anti CD3 Ab to enhance BM NS activity after injection in vivo. In vitro, NS cells suppressed the T cell response to anti CD3 Ab approximately 50%; the suppression was dependent upon IFN-X, but could not be enhance by TH-2 supernate. Thus there is a difference in the ability of NS cells to suppress T cell proliferative responses induced by Con A or anti CD3 antibody. In vivo, C3H/HeJ mice were injected i.p. with (300 μg of anti CD3 antibody and BM NS activity examined 24 hrs later. BM cells from mice injected with anti CD3 showed greater suppression than controls injected with hamster 1gG. The data suggest that NS cells are activated by lymphokines associated with TH-2 cells but suppress TH-1 proliferative responses. Supported by The University of Akron grant 534540.

Board N HIGH-RESOLUTION IMMUNOSTAINING OF MALIGNANT HUMAN TISSUE EMBEDDED IN EPOXY (SPURR). David L. Mason, Miguel A. Pedraza and John P. Boblett, Wittenberg University, Springfield OH 45501.

A series of neoplasms embedded in Spurr were sectioned and immunostained for specific antigens. The image information produced from plastic is superior to conventional paraffin sections. Antigen-antibody interaction is highly resolved and background staining is reduced. Tissue previously embedded in paraffin can be dewaxed and reprocessed into Spurr with no loss of immunoreactivity. In addition, plastic sections can be efficiently immunostained on an autostainer.

Board O HIGH-RESOLUTION MICROSCOPY ON INFECTIOUS AGENTS IN HUMAN TISSUES EMBEDDED IN EPOXY RESIN (SPURR). David L. Mason, Miguel A. Pedraza, John P. Boblett and Martha L. Howard, Wittenberg University, Springfield OH 45501.

Infectious agents, including bacteria, fungi, and protozoans, can be clearly identified in Spurr-embedded tissue sections. Comparing the results with corresponding paraffin embedded tissue reveals that the resolution is superior in plastic, thereby, providing the pathologist with significantly improved image information for identification. Tissues previously embedded in paraffin can be dewaxed and reembedded in Spurr, resulting in the same improved resolution of the infectious agent. The two main objections to routine plastic embedding of small endoscopic and bone marrow biopsies are: 1) immunohistological procedures are difficult to perform reliable and consistently, and 2) specific etiological agents such as mycobacteria or fungi cannot be detected. We and other authors have demonstrated that immunologic reactions can be carried out in plastic embedded sections with consistent and reliable results even when they are processed by a computerized robotics system. The results presented in this poster show the high-resolution achieved in plastic.

POSTER SESSION
3:00 PM, Saturday, April 23, 1994
Dana-Hilton Connector

Board A AN EVALUATION OF ESOPHAGEAL TUMORIGENICITY IN MALE F344 RATS FOLLOWING TREATMENT WITH N-NITROSOMETHYLBENZYLAMINE. Joseph C. Siglin and Gary D. Stoner, Medical College of Ohio, Dept. of Pathology, 3000 Arlington Ave., Toledo OH 43699.

The asymmetric nitrosamine, N-nitrosomethylbenzylamine (NMBA), has been utilized by several investigators to induce esophageal tumors in rats. While many studies have focused on the histogenesis of NMBA-induced tumors, no single, systematic study has been undertaken to assess the tumorigenicity of NMBA following various treatment protocols. In the present study, groups of 30 male rats received NMBA s.c. at cumulative dosages of 0, 5, 7.5 or 10 mg/kg. These dosages were achieved in 1 to 6 individual injections, given over a period of 1 day to 2 weeks. An additional group received a cumulative NMBA dosage of 7.5 mg/kg, given in 15 s.c. injections over 5 weeks. After 20 and 30 weeks, both the incidence and multiplicity of esophageal papillomas were significantly increased in rats receiving NMBA at a cumulative dosage of 7.5 mg/kg (15 s.c. injections over 5 weeks). Other NMBA treatment regimens were generally ineffective in producing esophageal tumors. These findings indicate that the duration of NMBA treatment, and not the total dose, is crucial in the tumorigenic potential of the carcinogen. Based on these findings, we postulate that the differential tumorigenicity of NMBA may be related to restricted carcinogen activation, or to lack of promotional stimulus from NMBA itself.

Board B SELECTIVE FRAME-SHIFT MUTATION IN CODON 176 OF THE P53 GENE IN RAT ESOPHAGEAL EPITHELIAL CELLS TRANSFORMED BY N-NITROSOMETHYLBENZYLAMINE (NMBA) OR BENZO(A)PYRENEDIHYDRODIOL(BP-DHD). Dian Wang, Liang You, Jeff Sneddon, and Gary D. Stoner, Dept. of Preventive Medicine, Ohio State University, Columbus OH 43210.

Previous studies in our laboratory showed that treatment of cultured rat esophageal epithelial cells (REEC) with NMBA or BP-DHD led to their neoplastic transformation. This study was undertaken to determine if chemically transformed REEC have mutations in the p53 suppressor gene. Mutations were analyzed by single-strand conformation polymorphism analysis of PCR amplified products and direct DNA sequencing of exons 5-7 and exon-intron junctions. A single base deletion of one cytosine in codons 174-176(TGCCCCCAC →TGCCCCAC) was found in the REEC transformed by both carcinogens. There was a correlation between this deletion in p53 gene and tumorigenic potential of the transformed REEC in newborn syngeneic rats. In addition, by immunocytochemical analysis using monoclonal antibodies (PAb421 and PAb240), we found no expression of p53 protein in the transformed REEC. These results suggest a good correlation between deletion and abnormal expression of the p53 gene in rat esophageal epithelial cells transformed by NMBA and BP-DHD Also, the G/C rich codons 174-176 in the rat p53 gene may be a target for both N-nitrosomethylbenzylamine(NMBA) and benzo(a)pyrene-dihydrodiol.

Board C GERMLINE MUTATIONS IN THE p53 GENE INCREASE MOUSE LUNG TUMOR SUSCEPTIBILITY. Q. Liu (1), R. Wiseman (2) Anderson (2), M. You, (1) Medical College of Ohio, Toledo OH 43699. (2) NIEHS-RTP, NC 27709.

The p53 gene is a tumor suppressor gene in both human and rodent tumors. Alterations in the p53 gene are the most common genetic defects detected in human cancers. Germline p53 mutations have been detected in LiFraumeni syndrome which is predisposed to multiple cancers at an early age. Similarly, transgenic mice carrying a missense mutation in the p53 gene develop a high incidence of lung, bone, and lymphoid tumors, while mice deficient for p53 were developmentally normal but have a higher incidence of lymphomas and certain sarcomas. Another report showed that reduction of p53 gene dosage did not increase initiation or promotion but enhanced malignant progression of chemically induced skin tumors. In this study, p53 transgenic mice were cross bred with A/J mice to study the function of the p53 gene in mouse lung carcinogenesis. An average of 30 tumors were observed in $p53^{+/-}$ mice and an average of 5 tumors in $p53^{+/-}$ mice 10 wks after exposure to MNU indicating a 6-fold increase. Similar results were also observed in the carcinogenesis studies using a mouse hybrid containing A/J mice crossed with p53 knockout mice (TSG-p53). A 4-fold increase in the tumor incidence was observed when tumors from 3 heterozygous mice plus 3 wild-type mice were counted.

Board D DELETION MAPPING OF A PUTATIVE TUMOR SUPPRESSOR GENE ON CHROMOSOME 4 IN MOUSE LUNG TUMORS. C. Herzog, R. Wiseman*, M. You, *NIEHS, Research Triangle Park, NC 27709, & Medical College of Ohio, Toledo OH 43699.

Genetic and molecular studies have implicated the interferon-α (IFN-α) gene cluster region of mouse chromosome 4 as the location of a putative tumor suppressor gene. We performed loss of heterozygosity studies on F_1 hybrid mouse lung tumors to further map the most frequently deleted region on chromosome 4. Ten simple sequence length polymorphism (SSLP) markers were analyzed, with focus on the IFN-α region. Allelic losses were detected in 23 of 46 (50%) of the C3A, 19 of 36 (53%) of the AC3, and 6 of 16 (38%) of the CDF, lung carcinomas examined. Also, allelic losses were detected in only 1 of 18 of the C3A, 0 of 20 of the AC3, 0 of 18 of the AC3, and 0 of 2 of the CDF, lung adenomas analyzed. In most cases the losses appeared to occur by nondisjunction. However, in ten carcinomas we observed incomplete losses that overlapped at SSLP marker D4M1T77, which is ~1 centi-Morgan(cM) distal to the IFN-X gene cluster. Moreover, three of these tumors had interstitial deletions involving only this marker. From these data we were able to deduce a critical region of about 1 cM as the likely domain of a novel tumor suppressor gene on mouse chromosome 4. We found this region to be deleted almost exclusively in the lung carcinomas studied compared to the adenomas, which suggests that its loss is a later event in the formation of these tumors.

Board E TUMOR MULTIPLICITY, DNA ADDUCTS AND K-*ras* MUTATION PATTERN OF 5-METHYLCHRYSENE IN STRAIN A/J MOUSE LUNG. Liang You (1), Jeff A. Ross (2), Mark J. Mass (2), Anthony Galati (1), Steve Nessnow (2), Gary D. Stoner (1), (1) Dept. of Prev. Med., Ohio State University, Columbus OH 43210, (2) Health Effects Research Lab., U.S. EPA, Research Triangle Park NC 27711.

5-Methylchrysene (5-MeC) is found in tobacco smoke and in the atmosphere. This study was undertaken to evaluate the carcinogenic potential of 5-MeC in strain A/J mouse lung, and to correlate the 5-MeC-DNA adduct profile in lung tissue with the mutation spectrum in the K-ras oncogene. Strain A/J mice were treated with 5-MeC, and their lungs were collected for DNA adduct analysis. Lung tumor multiplicity and the K-*ras* mutation pattern in the lung tumors were determined at eight months after 5-MeC treatment. 5-MeC was found to be a potent inducer of lung adenomas in strain A/J mice. At 200mg/kg, more than 100 adenomas/mouse were induced. Six 5-MeC-DNA adducts were observed, with one major adduct and five minor adducts. The major adduct exhibited a chromatographic mobility consistent with a nonpolar adduct. A minor adduct comigrated with the standard N^2-deoxyguanosinc adduct of 5-MeC-diolepoxide I. Characterization of the 5-MeC-DNA adducts is currently underway. The K-*ras* mutation spectrum contained a high proportion of G->T tranversions, a mutation consistent with the formation of diolepoxide adducts. This abstract does not necessarily represent policy of the U.S. EPA.

Board F ANALYSIS OF THE ALTERNATIVE TRANSCRIPTS OF THE K-*ras* GENE FROM NIH 3T3 CELLS TRANSFORMED BY DNA FROM

SPONTANEOUS MOUSE LUNG TUMORS. Y. WANG AND M. YOU, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699.

Previous studies have shown that the K-*ras* gene is alternatively spliced into two distinct transcripts and both contain the first three exons and either of the fourth exon, exons 4A or 4B. These two alternatively spliced K-*ras* transcripts, K-*ras* 4A and K-*ras* 4B were co-amplified by RT-PCR method to determined the relative amount of expression of each transcript. K-*ras* 4B RNA was expressed about 1.6 to 10-fold higher than that of K-*ras* 4A. Both K-ras and K-*ras* 4A transcripts contained the same activating mutation in the K-*ras* gene in a given cell line. These results indicate that K-*ras* 4B RNA is the major transcript of the K-*ras* gene in NIH 3T3 cells.

BOARD G DETECTION OF MOUSE LIVER TUMOR SUSCEPTIBILITY GENES BY ARBITRARILY PRIMED PCR (AP-PCR). D-Y. CHENG, M. YOU, AND Y.WANG, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699.

Mouse liver tumor incidence varies markedly among inbred strains of mice. Analysis of liver tumorigenesis in recombinant inbred strains suggest that the genetic hepatocarcinogen sensitivity (*Hcs*) loci are involved in the liver tumor susceptibility in these mouse strains. However, the identity of Hcs genes has not been identified. In this study, we used AP-PCR to identify the candidates of *Hcs* genes. Total RNAs from liver tissue of A/J, AKR, Balb/c, C3H, C57, C58, DBA, *Mus spretus*, SJL, SWR strains of mice were isolated and the first-strand cDNA was synthesized by reverse transcription reaction with an arbitrary oligonucleotide primer. The cDNA was amplified by polymerase chain reaction (PCR) with the same primer. The PCR product was end-labeled with ^{32}p and fractionated on a denaturing polyacrylamide gel. Several unique fragments were found only in the liver cDNAs of susceptible strains while many unique fragments were only observed in the liver cDNAs of resistant strains. Currently, these fragments are being cloned and sequenced. These clones will be used for the screening DNA library to identify the *Hcs* genes.

BOARD H EXPRESSION OF TRANSFORMING GROWTH FACTOR ALPHA IN NORMAL, PRENEOPLASTIC AND NEOPLASTIC EPITHELIUM OF RAT ESOPHAGUS. QIAN-SHU WANG, GAUTAM N. BIJUR, FREDIKA M. ROBERTSON, LEENA KHARE AND GARY D. STONER, DEPT. OF PREVENTIVE MEDICINE, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Transforming growth factor alpha (TGF-α) is a 50 amino acid polypeptide which has mitogenic activity mediated through interaction with epidermal growth factor receptor (EGF-R) and subsequent activation of a tyrosine kinase signal transduction pathway. The goal of the present study was to correlate the expression of TGF-α in esophageal epithelial tissues isolated from rats treated with N-nitrosomethylbenzylamine (NMBA), using immunohistochemical techniques. TGF-α staining was prevalent within the cytoplasm and supranuclear area of cells in preneoplastic and neoplastic lesions in tissue isolated from NMBA treated rats compared to the low levels of TGF-α detected in control tissues. TGF-α immunoreactivity was confined to the differentiated cell compartment in normal tissues. However, in preneoplastic and neoplastic tissues, there were proliferating cells that stained with TGF-α specific antibodies. The proliferating cells were detected based on immunochemical staining of proliferating cell nuclear antigen (PCNA). The number of PCNA positive cells were increased in both neoplastic and preneoplastic tissues and was significantly greater than the number of proliferating Cells in normal tissues. This observation suggests that production of TGF-α may play a role in esophageal tumorigenesis in this model, and TGF-α may modulate both esophageal epithelial cell differentiation as well as mitogenesis.

BOARD I DIFFERENTIAL CONTROL OF AUTOCRINE TRANSFORMING GROWTH FACTOR-ALPHA EXPRESSION IN HUMAN COLON CARCINOMA CELLS. D. JIANG, G.M. HOWELL, J. WANG, J. LIANG, L. BRATTAIN, J. YANG, L.E. GENTRY, M.G. BRATTAIN AND L. SUN. DEPT. OF BIOCHEMISTRY, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699.

HCT116 cells have an intracrine Transforming Growth Factor-α (TGF-α) loop, whereas CBS cells have an extra cellular autocrine loop. We compared the control of TGF-α expression in these cells to determine whether the inaccessibility of autocrine TGF-α in HCT116 cells reflects different mechanisms for its control. The presence of EGF enhances the release of TGF-α into conditioned medium. Both HCT116 and CBS cells released 2-fold higher levels of TGF-α into medium supplemented with transferrin (T), insulin (I) and EGF (E) than in medium with only TI. However, other growth factor combinations containing EGF (i.e.,EI,TE or E) did not enhance TGF-α release and gave lower levels of TGF-α than TI. This suggested that the EGF effect requires synergism with both T and I in this system. CBS cells showed a 2-fold higher level of TGF-α in the medium than HCT116 cells despite equal levels of mRNA. Immunoprecipitation data suggested that HCT116 cells retained a large amount of intracellular precursor protein while intracellular TGF-α was not detectable in CBS cells. Pulse chase experiments showed a substantially increased 1/2 life for TGF-α. We conclude this defect in processing may result in sufficiently high concentrations of TGF-α to generate intracellular activation of the EGF receptor.

BOARD J TRANSCRIPTIONAL CONTROL OF AUTOCRINE TRANSFORMING GROWTH FACTOR (TGF-ALPHA) IN COLON CARCINOMA CELLS. D. WANG, G. M. HOWELL, L. HUMPHREY, L. YANG & M. G. BRATTAIN. BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699-0008.

Previous work has shown that well-differentiated colon carcinoma cells can be continuously grown in defined serum free medium supplemented with transferrin (T) ,insulin (I) and EGF (E). The cloning efficiency of well differentiated colon carcinoma cells in limiting dilution experiments was dependent upon the presence of all three factors but once exponential growth was achieved EGF was not required for growth. TI is required for mitogenesis induction of quiescent cells, but EGF is not. This suggested that TGF-α might be an autocrine factor for FET cell and characterization of autocrine TGF-α expression as a function of growth state showed that exponential cells secreted the highest level of TGF-α into tissue culture medium (~10 fold more than quiescent cells). The high level of TGF-α expression in exponential cells was dependent upon EGF in tissue culture medium as levels of TGF-α secreted were 2-3 fold higher in TIE medium than in TI medium. TGF-α mRNA level was also 2-3 fold higher. CAT assay showed that transcription was also increased 2-3 fold by EGF in the culture medium. Using heterologous promoter assays and gel shifts assay a novel EGF responsive DNA element has been found.

BOARD K EXPRESSION OF CRIPTO IN HUMAN COLON CARCINOMA CELL LINES. SUDHAKAR AMMANAMANCHI, SRINIVAS VENKATESWARLU, YONG KO, AND MICHAEL G. BRATTAIN, MEDICAL COLLEGE OF OHIO, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, 3000 ARLINGTON, TOLEDO OH 43614.

Cripto (CRPT) is a 188AA polypeptide which belongs to the epidermal growth factor (EGF) gene family. Literature survey suggests that CRPT may be associated with tumor progression and differentiation. So, we have decided to characterize the plausible role of CRPT in human colon cancer cell differentiation and growth regulation. As a first step in the development of a quantitative RNase protection assay to estimate the CRPT message levels we have generated a 598 bp CRPT specific DNA from λGT DNA library using a PCR method. It appears that CRPT is highly expressed in the well-differentiated group III (GEO, FET, CBS) human colon carcinoma cell lines compared to group I (Ω). In order to monitor the CRPT expression and its effect on tumorigenicity of the cell, attempts are underway to stably transect the low and high CRPT expressing limiting dilution clones with the sense and antisense gene expression vectors, respectively. For this purpose a full length 2 kb cDNA has been cloned into pcDNAI expression vector in the sense and antisense orientation. CRPT protein levels both in the conditioned medium and cell extract are being determined by raising a polyclonal antibody against a cripto specific synthetic oligopeptide.

BOARD L DOSE AND TIME DEPENDENT EFFECTS OF PHENOBARBITAL (PB) ON HEPATIC CELL PROLIFERATION OF MALE B6C3F1 MICE. LYDIA D. SCHAFER, PH.D., AND JAMES E. KLAUNIG, PH.D. MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Phenobarbital (PB) is a hepatic carcinogen in rodents and its carcinogenicity may be related to effects on hepatic cell proliferation. In this study, we examined the effects of PB on the time course and dose dependency of hepatocyte DNA synthesis. Male B6C3F1 mice received either 0, 20, 100, or 500 mg/l of PB continuously in their drinking water. After 1, 2, 6, and 13 weeks, three mice/treatment groups were sacrificed. Three days prior to sampling, each animal received a mini-osmotic pump containing tritiated thymidine (3HtdR). Hepatic histologic sections were prepared and DNA synthesis was evaluated by autoradiography. An induction of DNA synthesis was noted in the 500 and 100 gm/l PB treatment groups after 2 weeks of treatment. After 6 and 13 weeks, no increases were seen. Thus PB induced a dose and time dependent increase in DNA synthesis over 2 weeks which returned to control levels by 6 weeks. These results correlate the induction of hepatic carcinogenesis and DNA synthesis by PB in male B6C3F1 mice.

BOARD M THE EFFECT OF A 19% MENHADEN OIL DIET ON DNA ADDUCT FORMATION OF 2-AMINO-3-METHYLIMIDAZO[4,5-*f*]QUINOLINE IN CDF$_1$ MICE. C. WANG & H.A.J. SCHUT, DEPT. OF PATHOLOGY, 3000 ARLINGTON AVE., HEB 202, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43614.

The dietary mutagen 2-amino-3-methylimidazo[4,5-*f*]quinoline (IQ) is carcinogenic in the CDF$_1$ mouse, affecting the liver, lungs, and forestomach. Dietary fish oil is known to inhibit carcinogenesis in rodents. We have evaluated the effect of dietary fish oil (menhaden oil, MO) on IQ-DNA adduct formation in CDF$_1$ mice. Young adult male mice were put on a) AIN-76A diet, b) an isocaloric AIN-76A diet containing 19% MO, or c) a regular powdered chow diet for 46 days. IQ was added to the diets (0.01%, w/w) from day 14 through day 34. Using ^{32}P-postlabeling assays IQ-DNA adducts were isolated on days 35, 36, 38, 40, 42, and 46. Total adduct formation in the liver, lungs, and stomach of animals on the chow diet was comparable to that in animals on the AIN-76A diet, but adduct levels were significantly reduced in the animals on the MO diet; decreases of 54.9-70.8% (liver), 14.4-77.5% (lungs), and 10.7-33.0% (stomach) were observed. Between 35 and 46 days, adduct levels in these organs did not significantly change in animals on any of the three diets. It is concluded that MO diets decrease IQ-DNA adduct formation in target organs of the CDF$_1$ mouse and that feeding of IQ for three weeks prolongs persistence of IQ-DNA adducts, independent of the type of diet (supported by NIH grant CA47484).

BOARD N INHIBITION OF DNA ADDUCT FORMATION OF 2-AMINO-3-METHYLIMIDAZO[4,5-*f*]QUINOLINE IN CDF$_1$ MICE BY DIETARY 4-IPOMEANOL. D. A. CUMMINGS AND H. A. J. SCHUT, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE. HEB 2027, TOLEDO OH 43614.

The food mutagen 2-amino-3-methylimidazo[4,5-*f*]quinoline (IQ) is carcinogenic in the liver, lungs, and forestomach of CDF$_1$ mice. 4-Ipomeanol (IPO) is a naturally occurring pneumotoxin under development for treatment of lung cancer. Because both IQ and IPO are activated to DNA-binding species in large part by the same cytochrome P450 (CYPIA2), we evaluated IPO as a potential chemopreventive agent by examining its ability to inhibit IQ-DNA adduct formation. Young adult male CDF1 mice were maintained on AIN-76A diet with or without

0.075% (w/w) IPO for 8 wk. During wk 4, 5, and 6 IQ was added to the diet (0.01%, w/w). Using ^{32}P-postlabeling assays, IQ-DNA adducts were isolated from organs 1-12 d after the last day of feeding IQ. At the various time points (1, 2, 4, 6, 8, 12 d) the presence of IPO in the diet reduced total adduct formation, amounting to a 33.6-41.8% decrease in the liver, 35.7-91.8% in the lungs, and 17.6-51.5% in the stomach. In addition, animals on the IPO diets showed an accelerated rate of adduct removal from the lungs and stomach, but not from the liver. It is concluded that dietary IPO inhibits IQ-DNA adduct formation in target organs of the male CDF_1 mouse and accelerates their removal from the lungs and the stomach.

BOARD O INDUCTION OF GAP JUNCTIONAL INTERCELLULAR COMMUNICATION IN HUMAN MYOMETRIAL CELLS BY ESTROGENS. MARSHA D. SMITHERS AND RANDALL J. RUCH, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Gap junctional intercellular communication (GJIC) between uterine smooth muscle cells (myometrial cells) is necessary for the development of coordinated contractions during labor. Myometrial gap junction protein (connexin43) expression and gap junction formation in vivo are enhanced by estrogens and prostaglandins and inhibited by progesterone. Our aim is to develop a cell culture system to study human myometrial gap junction regulation. In the present study, X-estradiol, ethinylestradiol, progesterone, and testosterone were tested for their effects on GJIC in SK-UT-1 human myometrial cells. GJIC was assayed by microinjection of fluorescent dye into cells and quantification of dye spread to neighboring cells. Connexin43 expression was monitored by northern blot. In control cells, dye transfer was approximately 20-25% and conngexin43 expression was nearly undetectable. β-Estradiol and ethinyl estradiol significantly enhanced these parameters whereas progesterone and testosterone did not. These results suggest that GJIC in SK-UT-1 cells is regulated by estrogens similarly to myometrium in vivo.

BOARD P ROLE OF GAP JUNCTIONAL INTERCELLULAR COMMUNICATION IN THE INHIBITION OF TRANSFORMED CELL GROWTH BY NONTRANSFORMED CELLS. CANAN ESINDUY (1), CHIA-CHENG CHANG (2), JAMES E. TROSKO (2), RANDALL J. RUCH (1), (1) DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614, (2) DEPT. OF PEDIATRICS AND HUMAN DEVELOPMENT, MICHIGAN STATE UNIVERSITY, EAST LANSING MI 48824.

The inhibition of transformed cell growth by cocultured normal cells has been described. We now report that growth inhibition of oncogene transformed rat liver epithelial cells (WB-ras and WB-neu) by nontransformed cells (WB-neo) requires heterologous cell gap junctional intercellular communication (GJIC). Rates of heterologous GJIC between WB-neo and WB-ras or WB-neu cells were approximately 25%. Transformed cell growth was suppressed when these cells were cocultured at 4:1, but not 1:1, ratios (WB-neo:WB-ras or WB-neu). Growth inhibition required heterologous cell contact and GJIC. Inhibition was not seen when cells were separated by permeable membrane inserts and noncommunicating WB mutants (WB-aB1 and WB-dA2) did not suppress WB-ras and WB-neu growth. However, mutants that were transfected with connexin43 cDNA (WB-aB1-S2) and communicated again (>80%) suppressed tumor cell growth. These data implicate GJIC in transformed cell growth inhibition. Supported by NCI CA57612 and CA21104.

BOARD Q EFFECTS OF BETA-CAROTENE ON GROWTH AND GAP JUNCTIONAL INTERCELLULAR COMMUNICATION IN MOUSE LUNG EPITHELIAL CELLS. RITA BANOUB AND RANDALL J. RUCH, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Minor dietary factors such as carotenoids are being examined for their abilities to prevent and reverse neoplasia. In rodent studies, carotenoids have been reported to inhibit the growth and formation of chemical carcinogen-induced lung neoplasms. Gap junctional intercellular communication (GJIC) may be involved in the regulation of cellular growth and phenotype. Carotenoids have been reported to increase GJIC in mouse fibroblast cultures, but have not been tested in lung epithelial cells. In this study, we have examined the effects of β-carotene on growth and GJIC of transformed (E9 and 82-132) and non-transformed (C10) mouse lung epithelial cell lines. Growth was measured by counting trypsinized cells whereas GJIC was assessed by fluorescent dye microinjection. β-Carotene (0.1-100 μM) reduced the growth of these cells and, surprisingly, also decreased GJIC. These data suggest that mouse lung tumor chemoprevention by β-carotene may not be related to effects on GJIC, but instead to the inhibition of cell growth. (Supported by the Ohio Cancer Research Association).

BOARD R GROWTH INHIBITION BY MONOTERPENES IN RAT LIVER EPITHELIAL CELLS DOES NOT INVOLVE ALTERED RAS PLASMA MEMBRANE ASSOCIATION. KRISTI SIGLER AND RANDALL J. RUCH, DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Dietary monoterpenes can prevent cancer and inhibit the growth of ras oncogene-transformed cells. This latter effect may be related to the inhibition of Ras protein farnesylation and plasma membrane association. We investigated this possibility in viral Ha-ras-transformed rat liver epithelial cells (WB-ras cells) in vitro. The monoterpenes, D-limonene, perillic acid, perillyl alcohol, menthol, and pinene (tested at 0.25-2.5 mM), inhibited the growth of WB-ras cells, but cells were not more sensitive compared to raf-transformed and nontransformed rat liver epithelial cells. Western blot analyses of cytosolic and membranous Ras protein in growth inhibited WB-ras cells revealed no change in Ras distribution. In contrast, lovastatin, a potent inhibitor of Ras farnesylation, specifically reduced WB-ras cell growth and increased cytosolic levels of Ras. Thus, growth inhibition of WB-ras cells by monoterpenes did not appear to involve Ras plasma membrane association and was dissimilar to that of lovastatin. (Supported by the American Institute for Cancer Research).

BOARD S CHANGES IN GAP JUNCTION FUNCTION AND EXPRESSION IN LINDANE-TREATED RAT LIVER EPITHELIAL CELLS. XIAOJUAN GUAN AND RANDALL J. RUCH. DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Lindane, a neurotoxicant, liver tumor promoter, and embryotoxicant, inhibits gap junctional intercellular communication (GJIC) in vitro. We now report that the mechanisms of inhibition are dependent upon treatment duration. Short treatment times (10-30 min) with lindane (10-50 μM) inhibited gap junction permeability (assayed by microinjection of fluorescent dye) in WB-F344 rat liver epithelial cells but had no effect on gap junction number (assessed by Cx43 immunostaining) or Cx43 expression (assayed by northern and western blot). Longer treatment times (1-4 h), however, resulted in decreased gap junction permeability, gap junction number, and phosphorylated forms of connexin43, but no effect on Cx43 mRNA levels. Extended treatments (1-14 d) significantly reduced gap junction permeability, gap junction number, and connexin43 protein and mRNA levels. These studies demonstrate that a toxic agent can have multiple mechanisms of action on GJIC depending upon treatment duration. (Supported by NCI-CA57612).

BOARD T GLUCOCORTICOIDS ENHANCE THE EXPRESSION OF GAP JUNCTION PROTEINS (CONNEXIN32 AND CONNEXIN26) IN CULTURED RAT LIVER CELLS. PING REN AND RANDALL J. RUCH. DEPT. OF PATHOLOGY, MEDICAL COLLEGE OF OHIO, 3000 ARLINGTON AVE., TOLEDO OH 43614.

Gap junction channels are comprised of twelve protein subunits (connexins). The major connexins expressed in liver tissue are Cx32 and Cx26. The regulation of Cx genes is poorly understood. Here we report that Cx32 and Cx26 expression in primary cultured rat hepatocytes and MH1C1 rat hepatoma cells was induced by the glucocorticoids, dexamethasone and hydrocortisone. This was evidenced by increased fluorescent dye-coupling, gap junction immunostaining, western and northern blotting, and nuclear run-on assays. Other types of steroids had no effect on Cx32 and Cx26 expression. Dexamethasone did not induce the expression of Cx32 or Cx26 or affect the expression of another connexin, Cx43, in WB-F344 rat liver epithelial cells. These data indicate that connexin expression in liver cells is regulated by steroid-, connexin-, and cell- specific mechanisms. The induction of Cx32 and Cx26 expression and gap junctional intercellular communication may be involved in the enhancement of hepatic differentiation and inhibition of hepatic growth by glucocorticoids. (Supported by NCI-CA57612).

POSTER SESSION
4:00 PM, Saturday, April 23, 1994
Dana-Hilton Connector

BOARD A FAST MONOSYNAPTIC INHIBITION IS REDUCED IN CA1 REGION OF HIPPOCAMPUS AFTER CHRONIC FLURAZEPAM TREATMENT. XU ZENG, XIANG-HUI XIE AND ELIZABETH I. TIETZ, DEPT. OF PHARMACOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Chronic oral administration of flurazepam (FZP) for 1 week reduces GABA-mediated paired-pulse inhibition in the hippocampus. To evaluate the contribution of GABAergic interneuron activity to this effect, pure, monosynaptically activated IPSPs, were recorded intracellularly in CA1 pyramidal cells of in vitro hippocampal slices (500 μm) with glass microelectrodes (3M KAc or 3M CsAc, 60-80 MX). Resting membrane potential was not different between groups and was held at -60 mV. Fast IPSPs elicited by just-subthreshold. Schaffer collateral stimulation were reduced 65% ($p<.01$). Monosynaptic IPSPs were activated by maximal stimulation in stratum radiatum or at the pyramidal/stratum oriens border in the presence of the excitatory amino acid antagonists, APV (50 μM) and DNQX (10 μM). Fast IPSPs in treated neurons, isolated with the $GABA_B$ receptor antagonist, CGP 35348 (25 μM), or Cs+ were reduced 45-48% ($p<.05$). The reversal potentials of fast IPSPs in treated slices were shifted in a depolarizing direction ($p<.05$) implying that post synaptic accumulation of Cl- may contribute to the reduction in the GABAA-mediated fast IPSP. Slow IPSPs, isolated with the $GABA_A$ receptor antagonist, picrotoxin, were reduced 42% in treated slices ($p<.05$) suggesting that decreased GABA release may also contribute to decreased GABA inhibition in hippocampus of BZ tolerant rats. Supported by NIDA grant R01-DA04075 and RSDA K02-DA00180 to E.I.T.

BOARD B LONG-TERM POTENTIATION (LTP) CAN BE INDUCED, BUT IS NOT MAINTAINED, IN HIPPOCAMPAL CA1 AFTER CHRONIC BENZODIAZEPINE (BZ) TREATMENT. MAHMOUD S. MOHAMMED, XU ZENG AND ELIZABETH I. TIETZ, DEPT. OF PHARMACOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Chronic flurazepam (FZP) treatment reduces GABA inhibition in hippocampus of BZ tolerant rats. Since GABA antagonists facilitate LTP induction and BZs interfere with induction and maintenance of LTP we tested the hypothesis that LTP is altered in CA1 region of hippocampal slices from FZP-treated rats. Theta burst stimulation (TBS) was produced in slices 2 or 7 days after FZP treatment, when residual BZs are no longer detectable in hippocampus. The experimenter was blind to rats' treatment histories. Baseline half-maximal EPSPs and population spikes elicited by Schaffer collateral stimulation were recorded extracellularly (glass micropipette, 2M NaCl, 25 mOhm). EPSP initial slope was measured as percent change from

baseline, 30 sec-60 min after TBS. The 150% increase in maximal EPSP slope induced by TBS was not different between groups (p=.88). After 60 min, EPSP slope was still elevated in both control slices and slices 7 days off FZP treatment. In slices 2 days off FZP treatment, EPSP slope declined to 50% of baseline by 30 min and to baseline by 45 min. Baseline population spike amplitude in slices 2 days after treatment was greater prior to (p<.01), but not after, LTP induction (p>=.13) suggesting a decrease in tonic GABA inhibition. Reduced inhibition in CA1 after chronic BZ treatment may be related to the failure to maintain or express LTP. Supported by NIDA grant R01-DA04075 and RSDA K02-DA00180 to EIT.

BOARD C DIFFERENTIAL REGULATION OF RAT BRAIN TYPE I BENZODIAZEPINE (BZ) RECEPTORS AFTER CHRONIC BZ TREATMENT. YUNXING WU, HOWARD C. ROSENBERG AND TED H. CHIU, DEPT. OF PHARMACOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699.

BZs are among the most commonly prescribed psychoactive drugs. Chronic use may produce tolerance and dependence. Treatment of rats with flurazepam (FZP) caused tolerance to several BZs and decreased the Bmax of [^{3}H]flunitrazepam (FNP) binding in cerebral cortex (CT) and hippocampus (HP), but not in cerebellum (CB). Chronic treatment with diazepam (DZP) or midazolam (MDZ) also produced tolerance. It was hypothesized that down-regulation of BZ1 receptors might be related to tolerance to these BZs. [^{3}H]Zolpidem (Zol), a selective agonist for BZ1 receptors, was used to detect the BZ1 receptor. Male, Sprague-Dawley rats were treated 3 wk with DZP via s.c. silastic reservoirs, 3 wk with MDZ (40 mg/kg/day) and 1, 2 and 4 wk with FZP in drinking water, and then sacrificed immediately after stopping treatment. Results of [^{3}H]Zol binding to homogenates from CT, CB and HP were analyzed by Scatchard analysis. In DZP or MDZ tolerant rats no change in K_d or B_{max} of [^{3}H]Zol binding was found in any of these three regions. In FZP tolerant rats, B_{max} of [^{3}H]Zol binding significantly deceased in CT, HP and CB after 2 and 4 wk treatment and also in CB after 1 wk treatment. These results suggest that BZ_1 receptor is differentially regulated in DZP-, MDZ- or FZP-tolerant rats.

BOARD D IMMUNOHISTOCHEMICAL LOCALIZATION OF MUSCARINIC ACETYLCHOLINE RECEPTORS IN RAT COCHLEAR NUCLEUS. WEIPING YAO AND DONALD A. GODFREY, DEPT. OF OTOLARYNGOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699.

The cochlear nucleus (CN) receives extrinsic and intrinsic cholinergic inputs, whose effects appear to be mediated primarily by muscarinic acetylcholine receptors (mAChR). In this study, we used a monoclonal anti-muscarinic-receptor antibody (M35, from CHEMUNEX) to study the distribution pattern of mAChR in rat CN. Young adult rats were deeply anesthetized with sodium pentobarbital and perfused with 3% paraformaldehyde/15% saturated picric acid in 0.1 M phosphate-buffered saline (pH 7.4). The pons-medulla portion of the brain, containing the CN, was dissected out and frozen in dry ice. Alternate sections of 25 µm thickness were cut in a cryostat and mounted on poly-lysine-coated slides for both mAChR and choline acetyltransferase (ChAT, using a monoclonal anti-ChAT antibody from Boehringer Mannheim, Inc.) immunohistochemistry. mAChR-like immunoreactive (mAChR-IR) labeling differed between ventral CN (VCN) and dorsal CN (DCN). In VCN, the mAChR-IR labeling was found in the magnocellular area in all subregions, with labeled dots around somata. These mAChR- IR dots may be the locations of mAChR on the cholinoceptive neurons. This labeling pattern matches the pattern of ChAT-IR labeling in neighboring sections, in which ChAT-IR puncta closely surrounded somata, suggesting an axosomatic cholinergic connection. On the other hand, the mAChR-IR labeling in DCN was more diffuse, and only a few labeled cells were found in the deep layer. This pattern also matches that of the neighboring ChAT-IR sections, with similar scattered labeling, suggesting that cholinergic innervation in DCN may be predominantly axodendritic. (Supported by NIH grant DC 00172)

BOARD E DEVELOPMENTAL REGULATION OF MYOGENIN, INSULIN-LIKE GROWTH FACTOR-II AND IGF BINDING PROTEIN-2 EXPRESSION BY MYOBLASTS. CATHERINE W. ERNST AND MICHAEL E. WHITE, DEPT. OF ANIMAL SCIENCE, OHIO STATE UNIVERSITY, 101 VIVIAN HALL, 2121 FYFFE RD., COLUMBUS OH 43210.

A mouse myoblast cell line, C_2C_{12}, and a turkey breast muscle satellite cell culture (TSC) were used to examine expression of myogenin (MYOG), insulin-like growth factor-II (IGF-II) and IGF binding protein-2 (IGFBP-2) expression during differentiation. Cells were harvested when approximately 80% confluent or fed DMEM with 2% horse serum and harvested when approximately 15%, 60% and 85% differentiated (fused). Northern blot analyses were performed using total cellular RNA and labeled rat cDNAs specific for IGF-II, IGFBP-2 (gifts of M. Rechler) and MYOG (gift of W. Wright). A single 1.8 kb mRNA transcript was detected for MYOG (a muscle-specific transcription factor) in both cell types. Expression was not detected in proliferating cells but increased as differentiation progressed. Expression of a single 4.0 kb IGF-II transcript increased with differentiation in C_2C_{12} cells but, for TSC, expression was highest in proliferating cells and decreased slightly at the onset of fusion. A single mRNA transcript (1.8 kb for C_2C_{12} and 2.0 kb for TSC) was detected for IGFBP-2. In both cases expression was highest in proliferating cells and decreased to approximately 50%, 30% and 10% of initial levels as differentiation progressed. To detect protein secretion of IGFBP-2 by these cells, serum free media was conditioned for 24 hr (CM) and collected from similar cultures for use in ligand blot and immunoblot analyses. The intensity of a 32,000 Mr band decreased with differentiation. This band was immunoreactive with an antibody raised against IGFBP-2 which was purified from MDBK cell CM. The level of antibody binding decreased by 50%, 90% and nearly 100% as differentiation progressed. These results suggest that IGFBP-2 and MYOG may be involved in the process of myoblast differentiation.

BOARD F IDENTIFICATION OF MUCIN IN THE URINARY BLADDER. MARY E. GRIST AND JOANA CHAKRABORTY, DEPT. OF PHYSIOLOGY AND BIOPHYSICS, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

A glycusaminoglycan (GAG) lining, coating the cells of the superficial layer of the urothelium has been proposed by several researchers. It is postulated that this layer functions as a barrier against bacterial infections. We used a variety of histochemical techniques employed by other investigators to identify this lining. These methods include alcian blue (AB)-nuclear fast red (NFR), colloidal-iron (CI)/NFR and Van Gieson's solution (VGS), periodic acid-Schiff (PAS), and mucicarmine/metanil yellow and tartrazine. Despite our continued efforts, we were unable to locate a continuous lining using these techniques like previous investigators. Although, we occasionally observed a patchy distribution of mucin on the superficial cells of the urothelium. However, using magnesium chloride in buffered alcian blue, we were able to identify a continuous layer of glycosaminoglycans on the surface of the superficial layer. In addition, we observed that the umbrella cells of the superficial layer as well as the other layers of the urothelium secrete a significant amount of acidic mucin. This acidic mucin appears to have properties that are different from glycosaminoglycans. Our observations show that surface GAG lining cannot be identified by using conventional techniques. (Supported by Kidney Foundation of NWO).

BOARD G CULTURING AND ANALYSIS OF COLLAGEN METABOLISM IN CELLS FROM FLEXOR RETINACULUM. KRISHNAN V. ALLAMPALLAM, JOANA CHAKRABORTY, KALLOL K. BOSE, JOHN H. ROBINSON, DEPT. OF PHYSIOLOGY AND BIOPHYSICS, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Carpal Tunnel Syndrome (CTS) is a compression neuropathy of the median nerve at the wrist. Literature review showed that no studies have been done on cells in flexor retinaculum from both normal and CTS patients. Cells of flexor retinaculum were cultured from patients with and without CTS. These cells are anchor and serum dependent. Like the skin fibroblast, these cells form layers. As compared to the normal dermal skin fibroblast, the cells from the flexor retinaculum with CTS grew more slowly. The cells from the normal individual seems to grow much better in the presence of acidic fibroblast growth factor. Electron microscope studies showed the presence of collagen dysplasia in the flexor retinaculum of patients with CTS. Analysis of procollagen from these cells showed the presence of a slow migrating prnα2(1) fragment. The collagen and procollagen were further analyzed by peptide mapping. Tissues are made stress resistant by the presence of bundles of collagen fibrils. Thus the formation of defective collagen may be one of the reasons some people are susceptible to repetitive trauma disorders like CTS. (This project was supported by a grant from the Douglass Foundation of St. Vincent Medical Center.)

BOARD H COMPARATIVE ANALYSIS OF THE SLIDE AGGLUTINATION TECHNIQUE AND THE ENZYME-LINKED IMMUNOSORBENT ASSAY IN THE SUBSPECIATION OF *P. AERUGINOSA*. ANGELA N. PAYTON, ROUDABEH J. JAMASBI, DEPT. OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

The slide agglutination technique is a method generally used to serotype *P. aeruginosa* strains using rabbit polyclonal antibodies. This method is cumbersome, expensive, and is not utilized in clinical laboratories. The objective of this study was to determine whether the ELISA method using specific monoclonal antibodies (mAbs) has an advantage over the slide agglutination technique. Three hundred strains of *P. aeruginosa* were obtained from St. Rita's Medical Center, St. Vincent's Medical Center, and The Toledo Hospital. All strains were identified by standard microbiological methods. Rabbit polyclonal antibodies, for slide agglutination, were purchased from Difco laboratories. The mAbs used were produced in our laboratory. Results of the two methods correlated well, however, some limitations were observed with slide agglutination. These included autoagglutination of 5% of the strains and the necessity of a high concentration of antibody (1:10 dilution) for the slide agglutination versus 1:400 dilution for the ELISA. The ELISA method using mAbs appears to be superior in serotyping *P. aeruginosa* strains.

BOARD I EXPRESSION AND CHARACTERIZATION OF YEAST PROTEIN PHOSPHATASE TYPE 1 IN E. COLI. JYOTI S. KOUSHIK & ERWIN REIMANN, PH. D., DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699.

The catalytic subunit of protein phosphatase type 1 (PPY1), in yeast Saccharomyces cerevisiae, is encoded by the GLC7 gene and plays a major role in the regulation of glycogen synthesis. In order to obtain sufficient amounts of the enzyme to carry out characterization studies, the 37 kDa yeast protein was expressed in E. coli. Expression of PPY1 was in the pET9d vector which makes use of the T7 promoter. However, the enzyme was expressed as an insoluble aggregate. It has been shown by other workers involved with the expression of mammalian phosphatase type 1 that inhibitor-2 is required for the expression of properly folded, soluble catalytic subunit. Using the same approach, the yeast PPY1 was coexpressed along with mammalian inhibitor-2 which was fused to glutathione transferase. The coexpression resulted in a small fraction of PPY1 being expressed in an active, soluble form. Experiments to improve the expression of soluble enzyme are in progress. Chickens were injected with the yeast PPY1 expressed in bacteria and the resulting antibodies were purified from serum. The purified antibodies could be used to detect PPY1 in yeast extracts by western blots.

BOARD J EXPRESSION AND CHARACTERIZATION OF PROTEIN PHOSPHATASE IN *SACCHAROMYCES CEREVISIAE*. JING WANG, ROBERT J. TRUMBLY, ERWIN M. REIMANN, MEDICAL COLLEGE OF OHIO, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, 3000 ARLINGTON, TOLEDO OH 43614.

The GLC7 gene of the yeast *Saccharomyces cerevisiae* encodes a protein (PPY1) very similar to the catalytic subunit of mammalian protein phosphatase 1. This protein was

overexpressed as a glutathione transferase (GST) fusion protein by subcloning the gene into an expression vector (pEGST) and the fusion protein was partially purified using a glutathione-agarose affinity column. However, its specific activity was only about 0.05 U/mg compared to that of mammalian phosphatase 1 which is about 10 U/mg. This may be due to incorrect protein folding. Our experiment recently shows that inhibitor-2, which is a 23 kD protein that specifically inhibits protein phosphatase from many sources, can inhibit PPY1. Therefore, coexpression of the yeast phosphatase and a fusion protein containing GST fused to mammalian phosphatase inhibitor-2 was carried out. A complex of PPY1 and the fusion protein has been purified from the yeast crude extract and its phosphatase specific activity is about 7 U/mg. Isolation of the yeast phosphatase from the complex and further characterization of this protein is being carried out.

BOARD K EXPRESSION AND ACTIVATION OF C-TERMINAL MODIFIED GLC7 IN *SACCHAROMYCES CEREVISIAE*. GUANG HONG AND ERWIN M. REIMANN, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699.

The yeast GLC7 gene encodes a type 1 protein phosphatase. The amino acid sequence of GLC7 is highly homologous to the mammalian phosphatase 1. Previous studies showed that cobalt and trypsin treatment activates GLC7 *in vitro* and trypsin cleaves the C-terminal region of GLC7 during this process. To understand how trypsin activation occurs, a C-terminal truncated GLC7 has been constructed to mimic the C-terminal cleavage by trypsin treatment. This mutant is constructed by oligonucleotide directed mutagenesis using PCR to introduce a stop codon at Arg-304 and a restriction site after the stop codon. This truncated form of GLC7 and other C-terminal mutants will be expressed in both *E. coli* and *S. cerevisiae*. To purify GLC7 and its regulatory subunits, a C-terminal poly-His tagged GLC7 has been constructed and expressed in *E. coli*, but the protein is insoluble. This poly-His tag, which is attached to the Arg-304 of GLC7 by a poly-Gly spacer, will allow easy purification on immobilized Ni^{++} columns. Since trypsin may cleave the C-terminal region of GLC7 during activation, this C-terminal tag is expected to be released during trypsin activation.

BOARD L STRUCTURE AND FUNCTION STUDIES OF GLYCYL-tRNA SYNTHETASE. HONG WU, JOHN DAVID DIGNAM, MEDICAL COLLEGE OF OHIO, DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, 3000 ARLINGTON, TOLEDO OH 43614.

The aminoacyl-tRNA synthetases play a crucial role in protein biosynthesis by specifically charging tRNA with their cognate amino acids. Glycyl-tRNA synthetase from B.mori has been expressed in *E. coli*. To study the function of specific domains and to identify tRNA binding and catalytic regions, truncated forms for the enzyme were constructed. Four deletions from C-terminus were expressed which contain 649, 627, 524 and 359 residues. All were soluble but lacked aminoacyl-tRNA synthetase activity. Deletion of a 55 residue N-terminal sequence with similarity to sequence found in some other tRNA synthetases, results in an enzyme with unaltered tRNA synthetase activity, but with reduced pyrophosphate exchange activity. Because threonyl-tRNA synthetase has similar sequence with glycyl-tRNA synthetase in what appears to be the active site, an expression vector constructed directed the synthesis of a hybrid protein containing the presumptive adenylate forming site from threonyl-tRNA synthetase and the presumptive tRNA binding site from glycyl-tRNA synthetase. The chimeric enzyme should charge glycyl-tRNA with threonine. The protein expressed in *E. coli* is intact and soluble; we have detected no amino acyl-tRNA synthetase activity.

BOARD M THE CHARACTERIZATION OF POLY-HISTIDINE TAGGED CYCLIC-AMP DEPENDENT PROTEIN KINASE. SCOTT R. DALTON, SUSAN DIGNAM, PH.D., ERWIN REIMANN, PH.D., DEPT. OF BIOCHEMISTRY AND MOLECULAR BIOLOGY, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699.

Cyclic-AMP dependent protein kinase is an allosteric enzyme that regulates many physiological events. The kinase is composed of four subunits; two regulatory and two catalytic subunits. When the subunits are combined, they form an inactive holoenzyme. The binding of four cAMP molecules activates the kinase by causing the release of the two functional catalytic subunits. The mouse catalytic subunit was expressed in *E. coli* using the pET-16b expression vector. This was done in order to obtain an N-terminal poly-histidine tagged enzyme for rapid purification using immobilized Ni^{++} columns. Since the tag has a strong affinity for the Ni^{++} column, the poly-histidine tagged catalytic subunit binds to the column, and can be eluted with 1M imidazole. Km values were determined for the substrates kemptide, ATP, histone and casein in odds to compare the mouse tagged and untagged catalytic subunit. These experiments revealed no significant differences between the tagged and untagged enzymes indicating that the tag is a useful tool for the purification of various mutant forms of this kinase from *E. coli* extracts.

BOARD N COMPARISON OF THE GROWTH OF WILD TYPE AND PROTEIN KINASE DELETION MUTANT *HERPES SIMPLEX* VIRUS TYPE 1 IN SEVERAL CELL TYPES. MONICA D. JONES AND DARLENE G. WALRO, UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON OH 44325-3908.

The genome of herpes simplex virus type 1 (HSV-1) encodes two putative protein kinases, US3 and UL13. The physiological role of either enzyme is not known. We have compared the growth of wild type virus and $US3^-$ deletion virus in several cell lines at twelve hour intervals for 48 hours and have observed that although both viruses grow to comparable titers in Vero cells, the $US3^-$ deletion virus consistently grew to titers which were several logs less than wild type virus in human fibroblast cells. The amount of DNA which was synthesized during infection with both viruses in either cell type was compared by dot blot analysis using the viral thymidine kinase gene as the probe. The amount of viral DNA detected during infection of Vero or human fibroblasts with the $US3^-$ mutant does not parallel the appearance of infectious virus in these cells, as it does during infection with wild type virus. These results suggest that the block in infection with the $US3^-$ deletion mutant is prior to virus maturation or release and may be at the stage of uncoating or initiation of DNA synthesis.

BOARD O COMPARISON OF KIDNEY SUPEROXIDE DISMUTASE (SOD) LEVELS IN MALE AND FEMALE TRAUMATIZED RATS. EUGENE ORLOWSKI, HENRY OKONTA, QING YANG, AUGUSTA ASKARI, RONALD H. BIRKHAHN, MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699-0008.

Since males respond more strongly to trauma than females, and since catabolic metabolites clear via kidneys, our research evaluated the total SOD, Cu/Zn-SOD, and MN-SOD defense system of kidneys from male (n=15) and female (n=16) Sprague-Dawley 9 month old rats. All rats were housed individually and fed a liquid diet ad libitum. After anesthesia by ip ketamine.HCl with accpromazine, half of male and half of female rats underwent bilateral femur fractures via digital manipulation. All kidneys were collected Day 5 post-trauma and analyzed for total SOD, Cu/Zn-SOD, and Mn-SOD by pyrogallol oxidation with KCN quenching. Protein content was determined by the Lowry method. When data were compared on the basis of units activity / mg protein wet kidney tissue, no significant differences were seen among any of the four groups (male control, male trauma, female control, female trauma). Thus, both genders were able to maintain the kidney SOD free radical defense mechanisms even when subjected to trauma. (Partial funding by NIH GM 39329)

BOARD P URINARY TAMM-HORSFALL PROTEIN IN DIABETIC WOMEN. ANGELA A. BELOW, JOANA CHAKRABORTY AND JOHNATHON S. ROSS, DEPT. OF PHYSIOLOGY AND BIOPHYSICS, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

Tamm-Horsfall protein (THP), a glycoprotein, is normally excreted in large amounts in urine. THP may be used as a specific marker for renal damage at the ascending limb of the loop of Henle and distal convoluted tubule. The objective of this research project was to determine the THP excretion in normal and diabetic post-menopausal women. Twenty-four hour urine samples were collected from 6 diabetics and 8 control patients. The average age of the diabetic and control group was between 60-70 years. Gel electrophoresis, western blotting and enzyme-linked immunosorbent assay (ELISA) were performed with each sample. In gel electrophoresis, the low concentrations of urine samples did not produce a visible THP band. The increased sensitivity of the western blot conclusively showed that the 6 samples from diabetic patients had substantially reduced amounts of THP in comparison to the 8 control and the standard samples. Quantitative analysis of the ELISA showed decreased THP in diabetic samples compared to the controls. Based on these results, it was concluded that urinary THP concentrations were substantially reduced in post-menopausal diabetics compared to controls. (This work was supported by a grant from the Douglass Foundation, St. Vincent Medical Center.)

BOARD Q COMPLIANCE AND ULTRASTRUCTURAL CHANGES OF LASER-ASSISTED VASCULAR ANASTOMOTIC SITES. Y. IZUMISAWA, M. SAKUMA, K. TAKEHANA, R. YASUDA, K. YAMASHITA, T. KOTANI, M. ABE, P. TANGKAWATTANA AND M. YAMAGUCHI. HOKKAIDO UNIV.(MED), OHIO STATE UNIV. (VET), RAKUNO-GAKUEN UNIV.(VET), EBETSU 069, JAPAN.

Correlation between compliance and ultra structural changes of laser-assisted vascular anastomosis (LAVA) in comparison with conventional suture vascular anastomosis (CSVA) was investigated. End-to-end anastomoses were performed on the common carotid arteries (~3mm in external diameter) of 11 healthy mongrel dogs. In LAVA, transected artery was approximated with four stay sutures of 7-0 polypropylene that were placed equidistantly from each other and was welded by Nd:YAG laser with 5W laser energy, 0.1sec pulse duration, 3 pulses and 0.5sec interval time at a 0.6mm focal spot. In CSVA, the artery was anastomosed with the continuous suture technique using 7-0 polypropylene mounted on an atraumatic needle. Thirty days after surgery, the animals were euthanized and the vessels were taken for compliance study (Stiffness parameter β) and transmission electron microscopy (TEM). All LAVAs and CSVAs were found patent macroscopically. There was no aneurysm formation. Stiffness parameter β of LAVAs was significantly ($p<0.01$) lower (i.e. higher compliance) than that of CSVAs (31.7+/-6.2(n=5) vs 41.4+/-7.5(n=5) for LAVAs and CSVAs, respectively). TEM observation revealed that LAVAs had minimal inflammatory response and the near-normal alignment of smooth muscle cells characterized by dense bodies, whereas CSVAs showed scar tissue. It was concluded that the higher compliance of LAVAs was the results of reduced foreign body response and minimal fibrotic action.

BOARD R PHARMACISTS' DUTY TO COUNSEL: RISK MANAGEMENT OR RISK ASSESSMENT? JON C. SCHOMMER, OHIO STATE UNIVERSITY, COLLEGE OF PHARMACY, 500 WEST 12TH AVE., COLUMBUS OH 43210.

The Omnibus Reconciliation Act of 1990 mandated patient counseling by pharmacists effective January 1, 1993. There has been controversy about whether pharmacists will infringe upon the physician - patient relationship if they provide this service. The purpose of this study was to assess if practicing pharmacists believe that their role in the provision of counseling is providing risk management information (counseling related to drug use) while the physician's role is providing risk assessment information (counseling related to drug choice). A random sample of 554 Ohio pharmacists was mailed a questionnaire to obtain their views about their role in providing risk information to patients. Six forms were developed, each containing one of six situations. Three situations showed the provision of risk management information and the other three showed the provision of risk assessment information to a patient. Pharmacists were asked who they believed should be responsible for providing information for the particular situation contained in their questionnaire. Forty five percent of the pharmacists responded to the survey. The results showed that pharmacists supported they should be more responsible for providing risk management information when counseling occurs rather than risk assessment information.

However, the majority did report that there should be a level of shared responsibility between pharmacists and physicians for both types of information. It appears that pharmacists recognize the unique contributions that both pharmacists and physicians contribute to patient care and desire a synergistic partnership with physicians.

BOARD S PERSONALITY ASSESSMENT AS POTENTIAL PREDICTORS OF STUDENTS PERFORMANCE IN AN ELECTIVE ON COMMUNICATION AND PSYCHOSOCIAL SUPPORT. SHERRY BAYLIFF, RICHARD WHILES, MARIJO B. TAMBURRINO, MD, ELIZABETH DONOVAN, RN, BENNETT G. HUMPHREY, MD, PHD., DEPT. OF PEDIATRICS, MEDICAL COLLEGE OF OHIO, PO BOX 10008, TOLEDO OH 43699-0008.

To determine if the California Psychological Inventory (CPI) will identify personality characteristics that help predict student performance in an experimental elective. Methods: Medical students (20) 1st & 2nd class participated in an elective to provide early patient-doctor relationships emphasizing listening. The focus was on open communication, psychosocial support, and finally experience with closure. Participants were required to complete the CPI. After orientation, the students spent two hours/week with a child or siblings from the oncology clinic. Students developed a "big brother/sister" type relation and provided appropriate social support. The CPI was used to attempt to identify any personality profiles that might correlate with outcome. Results: The CPI was easy to administer, analyze and was well accepted by the students. This 468 item personality inventory was designed to measure positive personality characteristics. Our student population fell into four groups (e.g. α= 7/20, β=3/20, γ=9/20, δ=1/20). Twenty standard scales also indicated some difference in our students (e.g. Empathy: 2/20 were scored low; 7/20 average and 11/20 high). Conclusion: There were different CPI findings among our students. The course will be completed at the end of March. This test has been used successfully at other medical schools in other student related education research projects. Evaluation of student performance will be correlated with CPI scales in January 1994.

BOARD T AWARENESS OF SEXUALLY TRANSMITTED DISEASES BY STUDENTS IN LARGE NIGERIAN PUBLIC SCHOOLS. ADAORA M. OKONKWO*, AUGUSTA ASKARI**, WALTER EDINGER***; MEDICAL COLLEGE OF OHIO, TOLEDO OH 43699-0008; *MEDICAL STUDENT, **SURGERY, ***PSYCHIATRY DEPTS.

Since young people all over the world are often confronted with tough decisions about sex, and since worldwide travel increases the likelihood of spreading sexually transmitted diseases, an open-ended questionnaire was administered to secondary school students ages 12 to 17 in large public schools in Nigeria. Questions were designed to elicit awareness and beliefs about which diseases could be transmitted through unprotected sex. When asked to identify the sexually transmitted diseases on a list of diseases (genital herpes, cholera, gonorrhea, hemophilia, HIV/AIDS, hepatitis B, malaria, sickle cell, syphilis, and yellow fever), 44% recognized HIV, 19% identified gonorrhea, 3.5% identified genital herpes, 1.5% identified hepatitis B as diseases that can be transmitted through sex. Our research highlights the urgent importance of exposing teenagers worldwide to information about sexually transmitted diseases and of enabling them to resist peer pressure, protect their own health and that of others. (Partially funded by MCO Foundation)

PODIUM PRESENTATIONS

Biological Sciences Division

AQUATIC BIOLOGY

9:00 AM - Saturday, April 23, 1994

Henry

Robert T. Heath, Presiding

9:00 SUBSTRATE PREFERENCE OF GASTROPODS IN THE LAKE LITTORAL DURING SEASONAL SUCCESSION. PAOLA C. LOMBARDO AND G. DENNIS COOKE. DEPT. OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

Freshwater gastropods are generally omnivorous, their food resources being fresh and decomposing plant materials. The hypothesis that gastropods shift from predominant herbivory to detritivory during seasonal succession, following macrophyte blooming and subsequent decline,was tested *in situ*. The gastropod assemblage occurring in the shallow littoral zone of East Twin Lake, Northeastern Ohio, was offered macrophytes organized as separate leaf packs of *Ceratophyllum demersum* and *Potamogeton illinoensis* plants, equally divided into fresh and decaying plant tissue items. The gastropod distribution on the leaf packs was surveyed from June through November 1993. Leaf packs were placed in the lake water, left for 7 days, and replaced with new ones after another 7 days. Changes in abundance of species over the 14 day period were analyzed with community and abundance indices, including the Percent Model Affinity Index (Novak and Bode, 1992). Abundance, biomass, and diversity of gastropods were higher in June, stabilized during summer and increased in October. Most gastropod taxa shifted from fresh to decaying leaf packs at the beginning of October. A short-term indoor observation showed that the taxa that exhibited a more marked shift from fresh to decaying leaf packs in situ were also those which seemed to prefer the non-living food items in the lab. These results indicate that gastropods might play an important role in the decomposition of macrophytes at the end of the summer season.

9:15 PROTOZOAN-MACROZOOPLANKTON TROPHIC COUPLING IN NEAR SHORE AND OFFSHORE LAKE ERIE. SOON-JIN HWANG, M. SORRIK, AND R.T. HEATH, DEPT. BIOL. SCI., KENT STATE UNIV., KENT OH 44242-0001.

The purpose of this study was to evaluate the importance of C-flux from protozoans to macrozooplankton (MACZ) along a nearshore-to-offshore axis in Lake Erie in 1993. MACZ grazing on protozoans was observed in duplicate 8L carboys filled with filtered (200 µm) lake water to which MACZ were added at 0X, IX, 2X or 4X ambient densities. Significant inverse relationships between MACZ biomass and growth rates of protozoans were observed (averaged r^2 = 60%; $p<0.05$). MACZ clearance rates on protozoan groups ranged from 0.25 - 2.03 ml (µg dry wt)$^{-1}$d^{-1} in near shore and from 2.12 - 150.54 ml(µg dry wt)$^{-1}$d^{-1} in offshore. In both environments, small nanoflagellates (NANF) were preferentially grazed by MACZ. Average C-flux from NANF to MACZ in nearshore was about four times higher than in offshore. High C-fluxes from protozoan to MACZ in both regions compared with algal C-flux to MACZ at the same season suggested that protozoans were a potentially important trophic link between bacteria and zooplankton in Lake Erie. This study was supported by Ohio Sea Grant.

9:30 THE IMPORTANCE OF PINCERS IN CRAYFISH FEEDING: A POSSIBLE FUNCTION OF CYCLICAL SEXUAL DIMORPHISM. TROY A. KELLER, UNIV. OF MICHIGAN, DEPT OF BIOLOGY, ANN ARBOR MI 48109-1048.

Male crayfish of the family Cambaridae have two distinct morphologies called cyclical sexual dimorphism. The form I reproductives have large pincers relative to their total body length while the summer form II males have chelae which are smaller relative to their body size. One possible explanation for the reduction in the relative pincer size of the summer form II males is that smaller pincers are more effective at capturing and manipulating food. I test this hypothesis experimentally in the lab using male and female *Orconectes propinquus* with and without the use of their pincers. Separate 24 hour feeding trials were conducted using algae (*Cladophora spp.*), snails (*Elimia livescens, Stegnicola emarginatus, Campeloma decisum, Planorbella smithi*), and aquatic insects (Megalopterans and Stoneflies). Crayfish did not require the use of their pincers to feed on algae or snails. Crayfish without the use of their pincers ate far fewer megalopteran larvae and stonefly nymphs than those with the use of their pincers. A positive relationship between pincer size and number of insects eaten may indicate that larger rather than smaller pincers are more effective for prey capture. *Orconectes propinquus* appears to use its pincers to capture mobile macro-invertebrates but not to feed on algae or snails. This study found no evidence supporting the hypothesis that the reduction in relative pincer size in form II male crayfish functions as a mechanism that increases foraging capabilities during the summer months.

9:45 PHOSPHATE UPTAKE PARAMETERS AND PHOSPHORUS DEFICIENCY INDICES IN SANDUSKY BAY AND LAKE ERIE. ROCHELLE STURTEVANT AND R.T. HEATH, DEPT. BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

Spatial and temporal patterns of phosphate uptake were examined for the mixed surface layer along an axis extending from the upper basin of Sandusky Bay to the central basin of Lake Erie during summer 1993. Parameters affecting velocity of phosphate uptake were measured using a Rigler bioassay: bioavailable phosphate (BAP), transport constant (K_t), and maximal uptake velocity (V_{max}). Rigler estimates of BAP indicate that concentrations are low (frequently less than 50nM). The K_t ranged from 3 to 300 nM. The V_{max} in Sandusky Bay was consistently greater than V_{max} observed at central basin sites in Lake Erie by at least an order of magnitude. Using track-etched hydrophobic filters to size-fractionate the community, we found that bacterial uptake generally amounted for 50 to 70 percent of phosphate uptake. Phosphorus deficiency indices (calculated as the ratio of optimum photosynthesis, P_{opt}, to V_{max} of phosphate uptake) were consistently low indicating a high degree of phosphorus limitation throughout the transect. This study was supported by Ohio Sea Grant and cooperative Institute of Limnology and Ecosystem Research.

10:00 EFFECTS OF ZOOPLANKTON GRAZING ON ALGAE IN NEARSHORE AND OFFSHORE LAKE ERIE. MATT SORRICK, S-J HWANG, AND R.T. HEATH, DEPT. BIOL. SCI., KENT STATE UNIV., KENT OH 44242-0001.

The purpose of this study was to examine the grazing effect of zooplankton (>200 µ) on algae at a eutrophic site in Sandusky Bay (SB) and an oligotrophic site in Lake Erie (LE). Zooplankton manipulation experiments were performed in duplicate in 8 L carboys. Carboys were filled with filtered (200 µ) lake water. Zooplankton (MACRO) were collected by vertical tow and added to the carboys at approximate concentrations of 0X, IX, 2X, 4X ambient zooplankton density. Initial samples were taken immediately after zooplankton additions. Carboys were stored in the dark and final samples were collected after 24 hours incubation. Copepods (Cyclopoids and Calanoids) and Ebosmina dominated the zooplankton of SB. Filamentous blue-green algae dominated SB nearly exclusively, consisting of >95% total algal biomass. SB zooplankton showed no significant grazing effect on algae. In LE site, small unicellular diatoms and greens dominated the algal community while the most abundant zooplankton were Bosmina and Calanoids. A grazing effect was observed in LE site. This study was supported by Ohio Sea Grant.

10:15 SEASONAL VARIATIONS IN THE PREDATION RATE OF CYCLOPOID COPEPODS IN SANDUSKY BAY, OHIO AT THREE DIFFERENT LEVELS OF FOOD DENSITY. Bruce S. Libman and R.T. Heath, Dept. Biol. Sci., Kent State Univ., Kent OH 44242-0001.

Surface water from Sandusky Bay was filtered through a 200μ mesh screen to remove macrozooplankton and placed in ten 250 ml opaque plastic bottles. To five of the bottles 7 cyclopoid predators were added. The other five bottles served as controls. The predators were allowed to feed on the remaining microzooplankton (rotifers < 200μ) for 24 hours. The same procedure was replicated but using water that was manipulated to yield either a ten fold increase or a ten fold decrease in microzooplankton (rotifers <200 μ) density. Small rotifers such as *Keratella cochlearis* and *Anuraeopsis fissa* were readily consumed by the predators, respectively 11 and 3 per predator per day during June at ambient density. At higher and lower densities of prey, the predation rates were lower than the rate at ambient density. However, the pattern of preference did not change between densities. These patterns were consistent throughout the summer months.

10:30 ARE HETEROTROPHY AND PHOTOHETEROTROPHY IMPORTANT PROCESSES FOR OBTAINING REDUCED CARBON COMPOUNDS BY *GONYOSTOMUM SEMEN* IN AN ACID BOG LAKE? Ping Jiang and Robert T. Heath, Dept. Biol. Sci. and Water Resources Res. Inst., Kent State U., Kent OH 44242.

This study was done in Triangle Lake, an acid bog lake, to estimate the relative importance of photosynthesis, heterotrophy and photoheterotrophy (vs. depth) to the carbon metabolism of *Gonyostomum semen* (Rhaphidophyceae). Uptake of ^{14}C-HCO_3^-, ^3H-glucose and ^3H-leucine by G. semen was conducted in a photosynthetron, an incubator that can hold 18 glass scintillation vials, illuminated at light intensities of photosynthetically active radiation (PAR) ranging from zero to 400 μE m^{-2} sec^{-1}. The resulting photosynthetic rate vs. irradiance parameters (P-I curve) were used, along with measurements of light penetration in the lake, to estimate the photosynthetic rate profile along with depth. Our results showed that photosynthesis of *G. semen* had a maximum rate at 0.2-0.3 meter and became insignificant below 1.5 meter. *G. semen* was not photohetcrotrophic. Heterotrophy by *G. semen* was the most significant form of obtaining reduced carbon compounds at depths greater than 2 m. This study was supported in part by Ohio Sea Grant.

10:45 FRESHWATER SPECIES OF THE DINOFLAGELLATE *CERATIUM*. Susan Carty. Heidelberg College, Dept. of Biology, 310 E. Market Street, Tiffin OH 44883 USA.

Freshwater species of *Ceratium* are reviewed. Species with the apical horn at an angle to the cingulum, *C. comutum* and *C. carolinianum*, are considered valid and closely related to each other. Species with the apical horn perpendicular to the cingulum, *C. brachyceros and C. hirundinella*, are also considered valid and closely related to each other. The named forms of *Ceratium hirundinella* (f. *austricum*, f. *brachyceroides*, f. *carinthiacum*, f. *furcoides*, f. *gracile*, f. *piburgense*, f. *robustum*, f. *scotticum*, f. *silesiacum*, f. *yuennanense*) have been analyzed for epitheca to hypotheca ratio, total length, cysts, epithecal shape and angle of divergence of hypothecal horns. Preliminary evidence indicates some may be valid species and others varieties of *Ceratium hirundinella*.

Plant Sciences Meeting
1:00 PM - Saturday, April 23, 1994
Van Wert
Dr. John Furlow, Presiding

A special meeting for all Academy members who are interested in the plant sciences will be held. A discussion will be held on how plant scientists may be accommodated within the new organizational structure of the Academy. For more information contact Dr. John Furlow at The Ohio State University Herbarium at (614) 292-3296.

BOTANY - PLANT SCIENCE
01:30 PM - Saturday, April 23, 1994
Van Wert
Brian C. McCarthy, Presiding

1:30 DIATOM COMMUNITIES IN THE CUYAHOGA RIVER (USA): CHANGES IN SPECIES COMPOSITION BETWEEN 1974 AND 1992 FOLLOWING RENOVATION IN WASTEWATER MANAGEMENT. Beverly J. Brown and John H. Olive, Kent State University, Biological Sciences, 256 Cunningham Hall, Kent OH 44242.

Periphytic diatoms were identified from several locations along the Cuyahoga River, a tributary of south central Lake Erie, during June 1992 following extensive renovations in wastewater management strategies. Prior to these renovations, a similar study had been conducted in 1974. A comparison of 1992 data with those of 1974 showed a shift in dominant species and number of taxa present. The dominant species at Hiram Rapids (upstream) shifted from *Cocconeis placentula* to *Cyclotella meneghiniana*, at Old Portage (middle reaches) from *Rhoicosphenia curvata* to *Nitzschia amphibia*, and at Independence (downstream) from *Navicula miniscula* to *Nitzschia amphibia*. A slight increase in the number of taxa was observed at Old Portage and Independence with a marked increase in number of taxa at Hiram Rapids.

1:45 50 YEARS OF "WEED" STUDIES IN OHIO (1882-1932). Ronald L. Stuckey, Museum of Biological Diversity, Ohio State University, 1315 Kinnear Rd., Columbus OH 43212.

During the hay-day of floristic weed studies in Ohio (1882-1932), 35 authors published 92 papers. The majority of these were prepared by botanists at the Ohio Agricultural Experiment Station. It was not until after the Station's establishment in 1882, did organized knowledge become available on the state's weed flora. W.R. Lazenby, OSU professor of horticulture and botany and also the Station's first director, wrote six papers, including a list of 229 species (1886) and the relationship of naturalized plants to soil and climate (1888). W.S. Devol (1883-1886), Lazenby's student and first appointed botanist, issued six reports, which included a list of farm weeds, descriptions of troublesome species, and information on characteristics of weedy plants (1884-1888). While employed as the second station botanist, Frederica Detmers (1891-1892) did not conduct research on weeds, but later during her career in Ohio, she published eight papers, the important ones on prickly lettuce (1890, 1907) and Canada thistle (1925, 1927). A.D. Selby (1884-1923), the third botanist, returned weed research to the Station. Among his contributions were the spread of Russian thistle (1894) and noxious weeds along thoroughfares (1895). His most important and useful contributions were an illustrated first *Ohio Weed Manual* (1897), followed by a second illustrated *Manual* (1906). A third and final illustrated *Manual* was published by H.A. Runnels and J.H. Schaffner (1931). Other noteworthy non-Station contributions were made by Harriet Mason (1895-1899) on individual species in the *Ohio Farmer*, the Kellerman's (1900) paper on the non-indigenous flora of Ohio, L.D. Stair (1900) with a list of railroad weeds, and Grace M. Kalter (1910) on weeds in the Miami Valley.

2:00 *THLASPI ALLIACEUM* L. (BRASSICACEAE) IN THE UPPER OHIO DRAINAGE. Allison W. Cusick, Division of Natural Areas & Preserves, ODNR, Fountain Square, Columbus OH 43224.

The occurrence of *Thlaspi alliaceum* L. in the North American flora has been generally overlooked. This species is absent from most regional manuals. Prior to 1982, this European mustard had been collected only in Pickaway Co. OH and Rockingham Co. NC. Thlaspi alliaceum has spread widely in the upper Ohio River drainage in the past decade. It currently is documented from 19 counties in five states: Indiana, Kentucky, Ohio, Virginia, and West Virginia. The species grows on moist roadsides and in low-lying, fallow fields along or near the Ohio River and its major tributaries. *Thlaspi alliaceum* differs from the widespread *T. alrvense* by the combination of pubescent stems, smaller fruits and reticulate seeds. Crushed tissue has an intense garlic odor and anthesis peaks ca. ten days earlier than that of *Thlaspi arvense*.

2:25 POSSIBLE NURSE TREE EFFECTS OF *JUNIPERUS VIRGINIANA* ON HARDWOOD TREE SEEDLINGS. Scott J. Meiners and David L. Gorchov, Dept. of Botany, Miami University, Oxford OH 45056.

Juniperus virginiana has been hypothesized to be a nurse tree in secondary succession. To test this hypothesis, field sampling, microenvironmental measurements, and an experimental planting of *Acer saccharum* and *Fraxinus americana* were done in the summer of 1993. Field sampling of old fields showed that there were higher densities of woody seedlings near *J. virginiana* individuals. Plantings (in exclosures) and measurements were taken near (30 cm) and far (3.0 m) from central *J. virginiana* trees. Environmental measurements showed that *J. virginiana* significantly reduced light, mean soil temperature, soil temperature fluctuations, leaf temperature, evaporation, and soil moisture (near vs. far comparisons). Germination rates of both species were higher in the far treatment, survival was high for *Fraxinus* and low for *Acer* with no distance effects. There were no differences in distance treatments in biomass or root:shoot ratios in one year old seedlings. While there is a spatial association between J. *virginiana* and deciduous tree seedlings, our results suggest that this association is not due to higher seedling survival or growth during the growing season near *J. virginiana*.

2:30 ELECTROSTATIC ENDOTHELIAL CELL SEEDING TECHNIQUE FOR SMALL DIAMETER (< 6 mm) PROSTHETIC VASCULAR GRAFTS. Gary L. Bowlin, M.S. and Stanley E. Rittgers, Ph.D, Dept. of Biomedical Engineering, University of Akron, Akron OH 44325-0302.

This endothelial cell (EC) seeding technique focused on enhancing EC adhesion by temporarily altering the graft lumen surface charge ("temporary glue") to a more positive state. This pilot study examined the EC adhesion using a static chamber apparatus and a parallel plate capacitor. The parallel plate capacitor dimensions were 36cm (L) X 10cm (W) and 31cm (L) X 3.8cm (W) for the upper and lower plates, respectively. The distance between plates was 9.5mm. The static apparatus was composed of a 1.25cm square segment of flattened PTFE graft material and a 9.5mm I.D. X 12mm (H) Teflon ring to hold the EC-DPBS suspension (0.30ml) in contact with the graft material. The EC concentration was 560,000 EC/ml. The seeding time was 30 minutes at the exposed voltages of 0.0, +0.75, +1.50 and +10.0 V. The EC seeding density was 130 cells/mm^2 at a voltage of 0.0 V and it increased up to 317 cells/mm^2

(2.4 X control) at +10.0 V applied. The total number of EC in the flattened phase of adhesion under identical conditions increased from 833 to 6,785 (8.2 X) with increasingly positively charged PTFE surfaces. The results of this study support the premise that the electrostatic interaction is an important factor in EC adhesion and spreading process and suggests that the electrostatic seeding technique may result in an increased patency of small diameter vascular prostheses.

2:45 REVISION OF THE GENUS *CLIBADIUM* (COMPOSITAE, HELIANTHEAE).

Jorge E. Arriagada, Dept. of Plant Biology, Ohio State University, 1315 Kinnear Rd., Columbus OH 43212.

The genus *Clibadium*, an important element of the Neotropical flora, contains 29 species distributed throughout Central and Northern South America. It is distinguished from closely related genera such as *Ichthyothere, Desmanthodium,* and *Stachycephalum,* by the large number of ray and disk florets, by the presence of pales, and by phyllaries organized in 1 or more rows. Chromosome numbers obtained from a majority of species support a base chromosome number of $x = 16$ for the genus and indicate a lack of polyploidy. The distributional pattern of the species is clearly allopatric. Morphological data support the recognition of two subgenera. *Clibadium* subg. *Eggersii* with 3 species, is characterized by a large number of carpellate florets, and with receptacular pales substending both carpellate and hermaphroditic florets. *Clibadium* subg. *Clibadium*, with 26 species, is distinguished by a low number of carpellate and epaleaceous disk florets. The present study includes field work, examination of more than 6,000 specimens, and cladistic analyses for helping resolve taxonomic limits and evolutionary trends within the genus.

3:00 A NEW FLORA OF THE VASCULAR PLANTS OF THE JUAN FERNANDEZ ISLANDS, CHILE.

Tod F. Stuessy, Dept. of Plant Biology, Ohio State University, 1315 Kinnear Rd., Columbus OH 43212.

The Juan Fernandez (= Robinson Crusoe) Islands lie 600 kms off the coast of continental Chile at 33 degrees S. latitude. There are three islands in the archipelago, Masatierra, Masafuera, and Santa Clara, with the former two approximately 50 km^2 and the latter 2 km^2. In this subtropical environment live more than 360 species of vascular plants, of which 42% are introduced weeds. Of the 209 naturally occurring species, 60% are endemic. Because of recent interest in the archipelago for research and conservation, a need exists for a modern inventory of vascular plants. The only complete flora is that of Johow (1896), now seriously out-of-date. Skottsberg (1922) made important additions, but provided no comprehensive flora. This new project involves making a complete descriptive and geographic inventory of the vascular plants combined with summaries of biological information, such as modes of speciation, phylogeny, chromosomal evolution, ecology, etc. Specimens on deposit in herbaria throughout the world will provide the data base for the project.

3:15 A NEW VIEW OF THE ROLE OF THE PAPPUS IN COMPOSITAE.

Tod F. Stuessy. Dept. of Plant Biology, Ohio State University, 1315 Kinnear Rd., Columbus OH 43212.

The pappus is one of the distinctive morphological features of Compositae. Throughout the family, many variations in pappus structure occur including bristles, scales, awns, crowns, glands, and even being completely absent. Traditional perspectives have suggested that the pappus is primarily an adaptation for fruit dispersal, such as seen in the common dandelion. Although dispersal is obviously important in some cases, especially when the pappus is well developed, the role is not so clear with other modifications, such as scales or awns. It is hypothesized that the principal adaptive role of the pappus in Compositae is protection of ovaries from predation, primarily from insects. Evidence for this point of view comes from life history information on selected species within the family with different pappus modifications and from correlations among other head features of genera within tribe Eupatorieae.

3:30 THE EVOLUTIONARY HISTORY OF THE ENDEMIC GERANIUMS OF HAWAII BASED ON RBCL SEQUENCE DATA.

Denise L Pax and Helen J. Michaels, Dept. of Biology, Bowling Green State University, Bowling Green OH 43403.

A phylogenetic study of the evolutionary origin and speciation of the endemic Hawaiian Geraniums has been performed utilizing the chloroplast gene sequence of 1.5 ribulose biophosphate carboxylase/oxygenase, large subunit (rbcL). The sequence data gathered thus far has shown that rbcL is evolving at a fast enough rate within this group to be a useful source of phylogenetically informative characters for determining relationships among the 9 species endemic to the islands. Published sequences from other taxa representing the three subgenera of genus *Geranium* were included in parsimony analyses carried out on PAUP (Phylogenetic Analysis Using Parsimony, v. 3.1) using 10 random replicates of a heuristic search, TBR branch swapping and MULPARS options. Six taxa from four different genera were used as outgroups. The trees generated were compatible with hypotheses of speciation for the group based on the distinctive morphology of these plants

3:45 COMPOSITION AND STRUCTURE OF THE UPLAND TROPICAL MOIST FOREST OF THE PETEN, GUATEMALA.

Brian C. McCarthy and Patrice A. Mutchnick, Dept. of Environmental and Plant Biology, Ohio University, Athens OH 45701.

Since the classic floristic studies of Lundell in the 1930s, few quantitative studies of the vegetation of the northern Peten region of Guatemala have been undertaken. This region is currently the center of many conservation efforts because of the vastness of intact forest cover, great biological diversity, and increasing human use pressure. The purpose of our study was to quantitatively examine the composition and structure of upland forest vegetation in a defined area of the north-central Peten. Five 2km transects were established in Tikal National Park and North of Uaxactun. A 20x50m quadrat was randomly placed every 300m along each transect and sampled for all woody stems > 2.5cm DBH. Cover data were collected in subplots to provide a characterization of the midstory (palms, shrubs & saplings) and understory (seedlings and herbs). Over 90 species of canopy trees were recorded, however, most were relatively rare. Four or five canopy species accounted for 40 50% of the relative importance in each sample area. Three species shared dominance at all sites: *Brosimum alicastrum, Pouteria durlandii* and *P. lundellii. Trichilia* spp. and *Cupania pricsa* were also found to be abundant Compared to previous descriptions by Lundell, *Swietenia macrophylla* (mahogany) and *Manilkara zapota* (chicle) seem to have decreased considerably in recent years-presumably due to human activity. Understories were extremely dense and dominated by shrubs in the genus *Piper* and palms of the genera *Chamaedorea, Cryosophila,* and *Sabal.* Seedling and sapling regeneration was adequate; however, herbs were uncommon.

4:00 AN ETHNOBOTANICAL ANALYSIS OF TREE SPECIES USED IN THE TROPICAL MOIST FORESTS OF PETEN, GUATEMALA.

Patrice A. Mutchnick and Brian C. McCarthy, Dept. of Environmental and Plant Biology, Ohio University, Athens OH 45701.

The Maya Biosphere Reserve, 1.5 million ha of tropical moist forest in northern Peten, Guatemala, supports sustainable extractive industries. However, only two tree species have been evaluated for their economic impact. This investigation, which used artifact and inventory interview data collection methods, quantified the use of over 90 tree species in the villages of Uaxactun (within reserve) and Caoba (outside reserve). Levels of use were measured by the number of responses given for each species and the number of uses attributed to each. Many species were identified as useful for more than one of the seven use categories. Approximately 50% of the species identified were useful for construction, while over 35% were identified as medicinals. In Caoba, *Swietenia macrophylla, Manilkara spp.* and *Cedrella odorata,* were identified most often and had the highest number of uses. Uaxactun residents relied most heavily on *Cedrella, Manilkara,* and *Caesalpinia velutina;* the latter primarily for house construction. The highest levels of use are for species whose abundance is in decline due to previous overharvesting; however, this reflects use patterns created when these commercially exploited woods were readily available. Currently, villages not constrained by harvesting and transportation restrictions are expanding their use of economically valuable species. Residents of Caoba consider 42% of all useful tree species to be marketable compared to only 10% in Uaxactun.

4:15 A FIELD STUDY OF PEONY SPECIES IN WESTERN CHINA.

Tao Sang, Dept. of Plant Biology, Ohio State University, Columbus OH 43210.

Peonies, with great ornamental and medicinal value, have been known as "king of flowers" and "queen of herbs" for more than one thousand years. There are approximately 30 species belonging to the genus *Paeonia* (Paeoniaceae) in the Northern Hemisphere, with distributional centers in the Mediterranean region and China. This field study investigated ecology and biology of wild populations of nine peony species endemic to western China. Studies of subsection Delavayanae in Yunnan and Xizhang (Tibet) provinces revealed that *P. delavayi* has larger numbers and sizes of populations than *P. lutea,* and they do not occur sympatrically. Another species of this subsection, *P. potanini,* was not found in Lijiang, Yunnan Province, where it is endemic, indicating that it is very rare or possibly extinct. On Taibei Mountain in Shanxi Province, *P. mairei* and *P. veitchii* were found sympatrically, but the former flowers earlier than the latter. *Paeonia xinjiangensis,* a species endemic to northern Xinjiang Province, was described in 1979 based on differences in root morphology with *P. anomala.* These two species were compared in the field at the first time, and they were discovered to be areally sympatric but ecologically partitioned. They can also be distinguished by minor differences in leaf morphology. Although the two species flower at the same time, no morphologically intermediate individual was found. All facts suggest these two taxa should be treated as good biological species.

4:30 THE EFFECT OF SOIL MOISTURE STRESS ON THE GROWTH OF FIVE INLAND HALOPHYTE SPECIES.

Carolyn H. Keiffer and Irwin A Ungar, Dept. of Environmental & Plant Biology, Ohio University, Athens OH 45701.

Previous studies have indicated that halophytes are capable of adjusting internal osmotic potentials in response to changing soil moisture and salinity conditions. In order to compare the relative drought tolerance of *Atriplex prostrata, Hordeum jubatum, Salicornia europaea, Sperqularia marina* and *Suaeda calceoliformis.* seedlings were grown in growth chambers under 3 water treatments (n = 14). Soil moisture conditions were monitored on a daily basis using WESCOR soil psychrometers. After 45 days, plant height and the ash free dry weight were determined for each plant. ANOVA procedures indicated that both the height and the ash free dry weight were significantly reduced under drought stress conditions for all species except *S. calceoliformis* ($p < 0.05$). Friedman's test of the relative means indicated a significant difference among species in height ($p < 0.02$) and ash free dry weight ($p < 0.5$) under the various water treatment conditions. *S. calceoliformis* appeared to be the least affected by drought since it obtained 78% of its relative height and 96% of its relative weight in the low water treatment group. Growth of *S. europaea* was more greatly inhibited than any of the other species under the low water treatment; height growth decreased by 42% and ash free dry mass decreased by 97% relative to that of the high water treatment.

4:45 NUTRIENT DYNAMICS OF FIELD-GROWN YELLOW-POPLAR (*LIRIODENDRON TULIPIFERA* L.).

Amy J. Scherzer, USDA Forest Service, 359 Main Rd., Delaware OH 43015.

Foliar nutrient dynamics and nutrient use efficiency can strongly influence how a plant responds to other environmental stresses such as atmospheric deposition, climatic variations,

or herbivory. Thus, it is important to understand how a plant utilizes nutrients as it grows. In the spring of 1992, a study was initiated to determine how leaf tissue nitrogen dynamics are affected by time of sampling, tree size/age, or position of sampling within the canopy. Preliminary data collected from 18 yellow-poplar ranging from 0.5 to 40 cm diameter indicated trees of all sizes exhibited similar patterns of N dynamics throughout the season. Nitrogen concentrations were highest in June and averaged 25.7±0.49 mg N/g. Concentrations dropped approximately 21% in July to 20.2±0.41 mg N/g and remained fairly constant through September. Just prior to leaf senescence in early October, concentrations averaged only 10.2±0.34 mg N/g, indicating these plants translocated or lost (due to herbivory or leaching) approximately 60% of the nitrogen prior to leaf abscission. Some variations in nutrient concentrations due to sampling position within the canopy were present, but differences were not significant at most sampling times. These findings will be compared to the responses of yellow-poplar at other sites.

CELL BIOLOGY - BIOCHEMISTRY
09:00 AM - Saturday, April 23, 1994
Williams
Thomas C. Jegla, Presiding

9:00 BLOCKING THE FUNCTION OF E-CADHERIN TOGETHER WITH P-CADHERIN INHIBITS CALCIUM-INDUCED REORGANIZATION OF JUNCTIONAL COMPONENTS IN CULTURED HUMAN KERATINOCYTES. Jani E. Lewis and Margaret J. Wheelock, Dept. of Biology, University of Toledo, Toledo OH 43606.

Human keratinocytes grown in 30 μM calcium display minimal cell -cell interactions. However, elevation of calcium to 1mM induces the formation of adherens junctions and desmosomes. Within 3-6 days after elevation of calcium to 1mM, the cells stratify to form a multilayered structure that resembles skin *in vivo*. Human kerntinocytes express two members of the cadherin family of adhesion molecules, E-cadherin and P-cadherin. E-cadherin is expressed throughout the stratified culture while P-cadherin is restricted to the basal layer. We have previously shown that function blocking antibodies to E-cadherin delay the formation of adhesive structures and disrupt the formation of a stratified culture. Antibodies to E-cadherin, however, do not prevent stratification. In the present study we show that antibodies to P-cadherin alone have minimal effect on the ability of the cells to form junctional complexes but antibodies to both cadherins, when added together, prevent formation of normal junctions and inhibit keratinocyte stratification. Supported by NIH CA44464 & AR39674.

9:15 EFFECT OF SUBSTRATE CONCENTRATION ON BIODEGRADATION OF ORGANIC COMPOUNDS. Majid Zarrinafsar and Yung-Tse Hung, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115, Jack Kuei-Chung Shih and Yu-Li Yeh, Ming Hsin Engineering College, Hsinchu, Taiwan.

The microbial growth and utilization of organic chemical is influenced by substrate concentration. There may be a threshold concentration, below which microbial growth cannot occur. In stream water, for example, less than 10% of 2,4-D was mineralized in eight days at initial concentrations of 2.2 ug/L and 22 ng/L, but at the higher concentrations of 0.22 mg/L , 80% was mineralized in the same time period. It has also been shown that at the low 18 ng/L concentration of glucose, the biodegradation rate was below the rate predicted by Monod kinetics. The effects of low concentrations of chemicals in natural waters on health issues is aged in this presentation. The criteria and standards of water quality limit maximum acceptable level of most organic pollutants to the 100 ug/L or less, while the ppb level of many organic compounds have been reported harmful. A chemical may not be toxic at low concentration in natural waters, however, if it bioaccumulates in living cells it may reach the toxic concentration.

9:30 INVESTIGATION OF Y-ORGAN REGULATION AND HEMOLYMPH ECDYSTEROIDS IN THE CRAYFISH *ORCONECTES IMMUNIS*. Kevin K. Mathur and Dr. Thomas C. Jegla, Kenyon College, Gambier OH 43022.

Molting in Crustacea is hormonally controlled by ecdysteroids released from the Y-organ (YO). Recent literature has shown that the major secretion from *in vitro* YOs of crayfish is 3-dehydroecdysone (3dE). furthermore, it has long been known that the YO is under negative control by Molt-Inhibiting Hormone, although positive stimulation has been implicated. This research examined two questions on ecdysteroid regulation in crayfish: 1) which ecdysteroids are found in the hemolymph and 2) does methyl farnesoate (MF) have a positive effect on ecdysteriodgenesis on in vitro YOs? Hemolymph extracts were taken and separated using Reverse Phase HPLC and quantified using RIA. Ecdysone (E) appears to be a major ecdysteroid found in the hemolymph with smaller amounts of 20-hydroxyecdysone (20-OHE), and other unidentified ecdysteroids. Thus, 3dE must be quickly converted to E in the hemolymph or in peripheral tissues. In addition, MF seems to have a stimulatory role on the YO at micromolar levels. Hence, it appears as though the YO may be under both positive and negative hormonal control.

9:45 THE ROLE OF PROTEIN KINASE C IN THE Y-ORGAN OF CRAYFISH *ORCONECTES IMMUNIS*. Danice K. Stone and Dr. Thomas C. Jegla, Kenyon College, Gambier OH 43022.

Molting in crayfish is initiated by ecdysteroid production in the Y-organ. Ecdysteroid synthesis in the Y-organ is negatively regulated by Molt Inhibiting Hormone (MIH). While the exact nature of this regulation is not fully understood, cyclic nucleotides and calcium are known to be involved, and Protein Kinase C seems to be involved in the crab *Cancer antennarius* (Mattson and Spaziani, 1987). Our study was undertaken in order to determine what role, if any, PKC plays in the regulation of crayfish Y-organ steroidogenesis. Y-organs were incubated in various concentrations of either PKC activators or inhibitors. Phorbol, 12-Myristate, 13 Acetate (PMA) strongly depresses ecdysteroid synthesis in activated Y-organs in the nanomolar and micromolar ranges. In replicate experiments the ED_{50} was somewhat less than 10^{-8} M. H-7, a selective inhibitor of PKC, did not alter synthesis at physiological levels. Based on our results, PKC seems to play a role in the negative regulation of ecdysteroid synthesis in crayfish Y-organs.

10:00 KINETICS OF BIODEGRADATION OF ORGANIC COMPOUNDS. Majid Zarrinafsar and Yung-Tse Hung, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115, Ruth Yu-Li Yeh and Jack Kuei-Chung Shih, Ming Hsin Engineering College, Hsinchu, Taiwan.

The Monod equation shows the relationship between the limiting substrate concentration and growth rate. This equation has modeled both pure and mixed cultures, and laboratory bench scale reactors to full size industrial units. However, there are indications that this equation is not valid in case of high concentration of substrate with inhibitory effects and in case of low substrate. In addition, end product may inhibit the enzymatic reactions to limit the use of the Monod equation. The excess substrate in batch results in the increase in the lag time, while in the continuous reactor, it will result in process instability. A model is developed for mutual substrate inhibition between glucose. It is shown that, when both 2,4-D and glucose are available, mutual substrate inhibition is observed. In this presentation, the biodegradation of pentachlorophenol is studied using the Halden modification of Monod equation to explain the inhibitory effects of substrate at low concentrations.

10:15 SURFACE AREA AND VOLUME OF SICKLED ERYTHROCYTES: APPLICATION OF A MATHEMATICAL MODEL. Deanna A. Juratovac, H. Westcott Vayo, and Neil A. Lachant, Dept. of Mechanical Engineering, University of Toledo, Toledo OH 43606.

We report findings on surface area and volume of sickle cells based on their morphology. Using slide preparations of sickled red blood cells, we measured cell parameters for three types of cells: convex-convex, parabolic, and S-shaped. These parameters were then used to calculate cell surface area and volume for 318 cells and to compute their surface area-to-volume ratios. Both adult and pediatric cells were measured. The surface area and volume data were found to be somewhat larger than reported measurements performed by micropipette aspiration techniques. Excellent correlation was found in distinguishing the three cell types. Our data suggests that the surface area and volume of sickled red blood cells may be approximated by mathematical models.

ENVIRONMENTAL BIOLOGY
1:30 PM - Saturday, April 23, 1994
Henry
John F. Wing, Presiding

1:30 CYTOLOGICAL DAMAGE IN NEEDLES OF WHITE PINE (*PINUS STROBUS*) EXHIBITING SYMPTOMS OF OZONE INJURY (TIPBURN). Carolyn J. McQuattie and George A. Schier, USDA Forest Service, 359 Main Rd., Delaware OH 43015.

Some white pine genotypes are particularly sensitive to ozone, exhibiting needle symptoms that range from a yellowish mottle to necrotic tips (tipburn). In July of 1992 at the Delaware Forest Service lab, a white pine tree exhibiting tipburn on many of its current year needles was observed near an uninjured tree of the same age and size. To compare cellular differences in the needles from the two trees, injured and uninjured needles from the damaged tree and needles from the healthy tree were prepared by conventional methods for transmission electron microscopy. All needles examined showed large starch grains in mesophyll cells. Disruption of mesophyll cells, including swollen chloroplasts and accumulations of dense compounds, was greater in injured and uninjured needles from the damaged tree than in needles from the healthy tree. The phloem from the injured tree also had a greater amount of phloem cell blockage (vesiculation) or cellular collapse. Previous studies of ozone injury have reported mesophyll disruption similar to cellular changes seen in this study, but ozone has not been reported to cause phloem cell collapse. Therefore, it is not known if the tipburn was caused by ozone alone or if phloem collapse and visual injury resulted from some unknown stress.

1:45 MAPLE HEALTH STATUS IN OHIO'S SUGARBUSHES. Robert P. Long, T.C. Weidensaul, and C.L. Capek, USDA Forest Service, 359 Main Road, Delaware OH 43015.

In 1991 and 1992, 35 sugar bushes in ten counties were examined to evaluate the health status of sugar and red maples (*Acer saccharum* Marsh. and *Acer rubrum* L.). In 1991, injury incidence and severity (cankers, decay, insect injury, or open wounds) on roots and boles, and

number of open tap holes were recorded on each of 700 trees (20/stand). On a sub-sample of 175 trees, foliage, soil, and increment cores were sampled to evaluate nutrient status, age, and radial growth rates. In 1991 and 1992, all 700 tree crowns were evaluated to estimate percent crown dieback and crown transparency. On roots, large wound (>5 cm^2) incidence and severity were greater in bucket-collection sugarbushes compared to those with tubing collection systems. In addition, the incidence of both small and large open wounds was positively correlated with the number of years a sugarbush has been tapped. In 1991 and 1992, over 95% of all 700 trees had >15% crown dieback. Tapped red maples, compromising only 10% of the 700 trees evaluated, had higher crown transparency and crown dieback than sugar maples. Foliar nutrients were variable across the 35 stands, but generally within the range reported for "healthy" maples. Foliar Al concentrations, reported to range from 31 to 60 ppm, averaged >100 ppm in four stands. Tree ages ranged from about 50 to over 275 years and mean basal area increment was age-dependent. While most sugarbushes were healthy, crowns in over mature stands were deteriorating.

2:00 STRUCTURE, COMPOSITION, AND DISTURBANCE HISTORY OF CRABTREE WOODS, A TRANSITIONAL OLD-GROWTH FOREST OF WESTERN MARYLAND. **Donald R. Bailey and Brian C. McCarthy, Dept. of Environ. and Plant Biology, Ohio University, Athens OH 45701.**

Crabtree Woods, believed to be one of the oldest Allegheny hardwood stands in western Maryland, was studied to determine stand history, composition, and structure. A 1.0 ha permanent plot was established at midslope and all stems >/= 2.5 cm DBH were identified, measured, and mapped. Increment cores were taken from all *Quercus rubra* stems >/=10 cm DBH to determine stand age and to aid in reconstructing stand history. The overstory (stems >/ =10 cm DBH) contained a total of 18 species with *Tilia americana, Q. rubra,* and *Acer saccharum* accounting for over 85% of the relative importance (RIV = 39.1, 24.9, and 21.9, respectively). *Castanea dentata* was clearly important in this stand at one time as evidenced by large standing dead and downed trees. The under story (stems < 10 cm DBH) contained 16 species with *A. saccharum* being the overwhelming dominant (RIV = 73.5). The overall stand density was 1296 stems•ha^{-1}, with 21.4% being stems >/=10 cm DBH. Stand basal area was determined to be 36 m^2• ha^{-1}, with 94.6% coming from overstory trees. The diameter distribution revealed a reverse-J pattern typical of an old, uneven-aged stand. While several trees were found to be in excess of 100 cm DBH, site quality is high and thus few trees exceed 150 years of age. Shannon-Weiner diversity (H') was estimated to be 1.741 for the overstory and 0.977 for the understory. Burn scars on tree trunks indicate that fire is part of the disturbance regime of this stand; however, absence of charcoal from increment cores suggests a history of only very light surface burns.

2:15 ESTABLISHMENT, SURVIVAL, AND GROWTH OF STRIPED MAPLE SEEDLINGS. **Jennie L. Everhart and Patricia A. Peroni, Slayter Box 618, Denison University, Granville OH 43023.**

This study identified variables important for the emergence, survival and growth of striped maple (*Acer pensylvanicum*) seedlings. Striped maple is of particular interest due to its reproductive strategy as a sequential hermaphrodite, its sex-biased population ratios, poor dispersal ability, patchy distribution, and its status as a major competitor of economically important species such as red pine. Influences of environmental variables on emergence of seedlings were studied in a permanent hectare plot containing 231 one m^2 subplots. Proximity to nearest maternal tree, photosynthetic active radiation, and soil depth were measured. Two types of subplots (with seedlings, without seedlings) differed significantly only in the mean distance to the nearest possible maternal tree. These results suggest that the largest determinant for establishment is dispersal. Similar measurements were taken to examine environmental influences on survival and growth. ANOVA at five 10 m^2 plots containing recently emerged seedlings showed that plots differed significantly in seedling height, leaf area, soil depth and nearest neighbor distance. An ANCOVA using site as a fixed effect indicated that there was a significant positive relationship between soil depth and leaf area. Mean values for initial height were greater for surviving seedlings, indicating that size is a good predictor of survival in emergent striped maple seedlings. Growth data revealed that distance to the nearest conspecific seedling had a small but significant effect on total leaf area and relative growth in leaf area. Dispersal distance, initial size, soil depth, and intraspecific competition are important factors in seedling performance in striped maple.

2:30 REGIONAL DISTRIBUTION, ECOLOGICAL IMPACT, AND LEAF PHENOLOGY OF THE INVASIVE SHRUB, *LONICERA MAACKII*. **Donald E. Trisel and David L. Gorchov, Dept. of Botany, Miami University, Oxford OH 45056.**

Lonicera maackii (Amur Honeysuckle), native to Manchuria and Korea, was originally introduced to North America ca. 1855 and was first reported as an escape from cultivation in 1961 in Hamilton County, Ohio. Analysis of herbarium specimens shows that non-cultivated shrubs of *L. maackii* occur in Ontario and 21 states of the eastern US. In southwestern Ohio, *L. maackii* can be found growing at densities of up to 6800 shrubs/ha in secondary forests. Because there is a reduced herb layer under dense stands of this shrub, *L. maackii* may be disrupting the natural succession of forests and old fields. *L. maackii* is photosynthetically active over a longer period than native woody deciduous species. In 1992 *L. maackii* leaf expansion began in early March and green leaves were retained through mid November, resulting in a photosynthetic period of 254 days. The photosynthetic periods of *Acer saccharum, Asimina triloba,* and *Lindera benzoin* were 190, 183, and 180 days, respectively. End-of-season leaf damage was lower for *L. maackii* (1.6% of leaf area) than for native woody species (e.g. *A. saccharum* = 8.5%). Leaf phenology and the relative lack of pathogens/herbivores may contribute to the success of this invasive shrub.

2:45 *POLYGONUM PERFOLIATUM* L. (POLYGONACEAE) NOW IN OHIO. **Marilyn Ortt, Div. of Natural Area & Preserves, ODNR, Fountain Square, Columbus OH 43224.**

The recent spread of *Polygonum perfoliatum* (L.) in Pennsylvania, Maryland and West Virginia has been well documented. A population is now established in an industrial area in the Ohio River valley in Washington Co., Ohio. *Polygonum perfoliatum* is an annual that has been known to grow more than six meters during the growing season. It clambers over the ground, buildings or adjacent vegetation which is usually killed because of the heavy shading. Recurved prickles along the petioles and weak stem enable it to reach several meters into trees. The numerous blue fruits that continue to ripen from early September until frost provide sufficient reproductive potential that prompt action will be required if an effort is to be made to control this invasion of *Polygonum perfoliatum* in Ohio.

3:00 POLLINATION ECOLOGY OF MONTANE/SUBALPINE BUMBLEBEES AGAIN. **Lazarus W. Macior, Dept. of Biology, The University of Akron, Akron OH 44325-3908.**

Data from a 1993 study of the pollination dynamics of six bumblebee (*Bombus* Latr.) species on seven plant species, of which they are the primary pollinators, in Berkeley Park, Mt. Rainier, concurred and contrasted with results of previous investigations. Relative frequencies of bumblebee species in the study area remained unchanged with *B. melanopygus* being commonest overall and on each plant species except *Penstemon rupicola* and *Castilleja parviflora oreopola*, which were most commonly pollinated by *B. occidentalis and B. flavifrons/ sitkensis*, respectively. Phenologically, the early-blooming *Phyllodoce glanduliflora, Dodecatheon jeffreyi,* and *Penstemon* were mostly or exclusively queen-pollinated, while the later-blooming *Pedicularis bracteosa, P. groenlandica,* and *Lupinus latifolius* were mostly worker-pollinated. Blooming at different times at different elevations, *Lupinus* was worker-pollinated at both collecting sites. Previously considered bee-pollinated, *Castilleja* was almost exclusively pollinated by hummingbirds. Examination of 489 bumblebee pollinators for corbicular pollen yielded almost equal numbers of pure and mixed loads for queen and worker castes; foreign pollen loads were very rare. The combined studies suggest that plant-pollinator associations are phenologically and reproductively stable and highly coordinated communities.

3:15 FORAGING RESPONSES BY *APHAENOGASTER RUDIS* TO VARIABLE FOOD REWARDS ON SEEDS OF *SANGUINARIA CANADENSIS*. **Stephenie Y. Liu and E. Raymond Heithaus, Biology Dept., Kenyon College, Gambier OH 43022.**

In myrmecochory, ants incidentally disperse seeds of many understory plants by responding to contents of the diaspore's elaiosome. Elaiosomes are fed to larvae in the colony nest. Although continued seed collection would be expected in this mutualistic system, the ant *Aphaenogaster rudis* is quickly satiated by seeds (carrying behavior decreases drastically after a few dozen seeds are taken). Hypotheses to explain the cessation of seed removal include: nest capacity is exceeded, sufficient nutrition is obtained, or elaiosomes include chemical inhibitors. These hypotheses were tested in seed-removal experiments using *Sanquinaria canadensis* seeds manipulated to provide different ratios of edible elaiosome to inedible seed. Food/seed ratios were altered by reducing or enhancing elaiosomes on seeds by half; controls were unmanipulated seeds and seeds with elaiosomes removed and then reglued. Ant nests were located by baiting, and treatments assigned randomly by colony and day. For the 63 experimental colonies, ants tended to collect more seeds with high elaiosome/seed ratios (35% fewer seeds with half elaiosome reduction, and 35% increase with half elaiosome enhancement). This is consistent with foraging theory and published data that ants respond to differences in food quality. The nest capacity hypothesis was not supported because ants did not harvest a consistent total seed volume. The sufficient nutrition hypothesis was not supported because ants did not compensate for elaiosome reduction by collecting more seeds. The chemical inhibition hypothesis was supported only if ants collect seeds for a limited amount of time following first exposure.

3:30 THE EFFECTS OF *SANGUINARIA CANADENSIS* ELAIOSOMES ON POPULATION DYNAMICS OF *APHAENOGASTER RUDIS*. **Manuel A. Morales and E. Raymond Heithaus, Biology Dept., Kenyon College, Gambier OH 43022.**

Myrmecochory is a mutualism providing dispersal to plants and food to ant larvae. Demographic benefits to plants are documented, but the hypothesis that ant populations are enhanced by collecting this particular food source is untested. The discovery that ants satiate quickly when collecting myrmecochorous seeds raises the question of whether this "mutualism" is truly reciprocal. In order to determine the effects of elaiosomes on the fitness of *Aphaenogaster rudis* colonies, we provided thirty ant colonies with *Sanguinaria canadensis* seeds, while another thirty colonies served as controls. Nests were located by baiting, then treatments were assigned randomly. Seeds were provided to satiation in four doses over seven days. All nests were collected one month after seed enhancements. Male and female gynes and workers were counted as adults and pupae. Variance in colony size was very high within experimental and control treatments, but we observed the following trends. Though enriched and control colonies had similar numbers of reproductives, the ratio of females to males shifted toward females in enriched colonies. The average number of female reproductives increased approximately 150% for elaiosome enriched (range 0-37) as compared to control colonies (range 0-36), while male reproductives declined by approximately 30%. Worker increases in enriched colonies were not statistically significant. These data add quantitative support to the hypothesis that the myrmecochory mutualism between ants and plants has a demographic component for ants.

3:45 LOW OFFSPRING SURVIVAL FOR OLD FEMALE WHITE-FOOTED MICE (*PEROMYSCUS LEUCOPUS*).

JOSEPH J. JACQUOT AND STEPHEN H. VESSEY, DEPT. OF BIOLOGICAL SCIENCES, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

As part of a long-term demographic study of white-footed mice in northwest Ohio, we wished to determine the relative contribution of young and old females to the next generation. Prior work has demonstrated that long-lived female *Peromyscus leucopus* produce litters at the same rate as short-lived females. Litter production rate is a crude fitness measure; therefore, we used offspring survival as a better measure of female fitness. We marked 75 litters in artificial nest boxes at an early age to follow their survivorship. The litter number (parity) of the mother was estimated by examination of previous capture records. Parity and maternal age were highly correlated, so parity was used as an index of maternal age. We classified litters by maternal experience as early, the first or second reproductive attempt, or late, all subsequent attempts. Offspring survival is known to be influenced by season of birth, and *P. leucopus* experiences a mid-summer lull in breeding; therefore, litters were classified as spring- or fall-born for analysis. Old females had significantly lower survival than young females. A significant interaction was found between parity and season. Offspring survival was significantly higher for litters produced in the spring by females of low parity. Spring-late, fall- early, and fall-late litters were statistically indistinguishable in offspring survival. These findings suggest that old, multiparous females invest less in offspring than do young females.

4:00 DIFFERENTIAL CHANGES IN RAPTOR COUNTS AT HAWK MOUNTAIN, PA DURING THE DDT ERA.

JOHN F. WING, WITTENBERG UNIVERSITY, PO BOX 7207, SPRINGFIELD OH 45501.

Wing (1994) has reported the total raptor count at Hawk Mountain shows cycle disruption during the early period of the DDT era. Here similar effects are reported for raptor subfamilies and tribes (with comments on separate species). Accipiters, buteos and the harrier all show visual evidence of cycling before World War II but the records are too short to test. In the DDT era (1946-1972), the accipiters (mostly sharp-shinned and cooper's hawks) show significant ($p<.01$) decline and cycle disruption up until 1964; and in the recovery and Post-DDT era their numbers increase and cycles apparently resume (but cycling does not reach significance). Buteos (mostly red-tailed and broad-winged hawks) level off rather than decline in the DDT era and show significant ($p<.01$) 3-yr cycles compared to significant 8-12 yr cycles ($p<.05$) in the recovery and Post-DDT era. The harrier counts rise steadily from 1934-1990 and cycling exists at least up until 1980. (Although raw data counts fail to show significance, residuals of counts do show a 10 year cycle at $p<.05$). Falcons (mostly kestrels) show both count increases and 10-yr cycle ($p<.05$) from 1946-1990, but cycle amplitudes are smaller during the DDT era. These findings of significant cycles (and cycle disruptions) in migrant counts do not imply local populations must show the same effects; indeed they may appear reliably only in large, aggregated accounts.

4:15 DISRUPTION OF 10-YEAR CYCLE IN TOTAL RAPTOR COUNTS AT HAWK MOUNTAIN, PA DURING THE ERA OF DDT USAGE.

JOHN F. WING, WITTENBERG UNIVERSITY, PO BOX 720, SPRINGFIELD OH 45501.

Bednarz et al (1990) analyzed Hawk Mountain raptor counts for effects of DDT on population trends. *A priori* they set up three eras: Pre-DDT (1934-1942), DDT (1946-1972) and post-DDT (1973-1986). During the DDT era they found significant declines in two accipitors with recovery beginning in 1964; and on this basis we sub-divide their DDT era into a Decline period (1946-1963) and a Recovery period (1964-1972). Also, in our analysis, we focused on cycles rather than trends. Wing et al (1993) already had found a 10-year cycle ($p<.05$) in total raptor count over the 57 years of record, and here we tested for disruption of this cycle during the DDT era, particularly during the Decline period. Analysis of cycles based on the contingency periodgram (Legendre et al, 1981) confirmed cycles were disrupted or foreshortened in the DDT era: short cycles of 3-6 years occurred but were not significant ($p<.10$); whereas statistically significant ($p<.05$) 9-year cycles were found for the combined DDT-Recovery period and the Post DDT era. These results suggest that cycles, as well as trends were affected by events during the DDT era. Except for those events, a 10-year cycle probably would have been even more evident over the 57 years of record.

4:30 HIBERNACULUM USE OF THE SPOTTED TURTLE IN CLARK COUNTY, OHIO.

ERIC S. MONSCHEIN AND TIMOTHY L. LEWIS, BIOLOGY DEPT., WITTENBERG UNIVERSITY, SPRINGFIELD OH 45501.

Ohio populations of spotted turtles (*Clemmys guttata*) appear to be declining, with previous studies implicating habitat destruction, predation, and over-collecting as the primary causes. Information on hibernaculum use and habitats in which they are located is essential for creating management plans for this species of special concern. We studied hibernating activities of 40 turtles from spring 1992 to spring 1994 at Prairie Road Fen in Clark County, Ohio. Although reportedly a solitary hibernator, we found the spotted turtle often over-wintered in groups. Hibernaculum use begins in September and increases as winter approaches. Turtles leave at irregular intervals during the spring prior to mating. Advantages of group hibernaculum use are unclear; disadvantages include increased vulnerability to predation and collecting.

4:45 GEOLOGIC BASIS FOR OHIO'S BIODIVERSITY.

JANE L. FORSYTH, DEPT. OF GEOLOGY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

Biodiversity of organisms demands diversity of habitats, which is mainly a product of a region's geology; its geologic materials (bedrocks, unconsolidated materials, and soils); its geologic processes (weathering, erosion, and deposition in Ohio); and its geologic history (nature and distribution of past species in a long sequence of different landscapes, this history determining their access to any site). Biologists would give different names to these three influences: substrates; aspect and micro-climates (on slopes and in deep valleys, all created by geologic processes); and evolution, or past paleogeographic access of any species to any site. Variations in these geologic-biologic conditions create greater diversity in habitat and thus in diversity at species. For example, diversity in plant species is a product of differences in substrate, aspect and microclimate, and evolutionary access to any location - all geologic factors. Animals, because of their locomotion and varying habitat demands at different stages in their life cycles, are less easy to characterize, but their diversity still responds significantly to these same three geologic factors, plus the factor of vegetational setting, a factor already also correlated with these geologic factors. Thus, a field biologist cannot effectively evaluate species diversity without a meaningful knowledge of the region's geology.

GENETICS
9:00 AM - Saturday, April 23, 1994
Seneca
Bernard C. Mikula, Presiding

9:00 ASSESSING GENETIC VARIATION IN THE HOUSE WREN WITH DNA FINGERPRINTING.

NIDIA ARGUEDAS, DEPT. OF ZOOLOGY, OHIO STATE UNIVERSITY, 1735 NEIL AVENUE, COLUMBUS OH 43210.

During the summer of 1993 blood samples were collected from house wrens nesting at three different sites in central and northern Ohio. DNA fingerprinting with Jeffreys' probes will be performed to determine these populations' level of genetic variation at these minisatellite loci. Band-sharing of unrelated individuals will be used to determine if DNA fingerprinting is an appropriate technique to assign parentage in this wide-ranging species. Analysis of five complete families will give preliminary information on the mating system as revealed by this molecular approach.

9:15 CHARACTERIZATION OF CONJUGAL TRANSFER IN *STAPHYLOCCOUS* USING AN AMINOGLYCOSIDE RESISTANCE PLASMID PT0105.

S. MCGREGOR AND L.GLATZER, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

There are several characteristics of conjugation which are unique to the *Staphylococcus* system. Conjugation is not reliant upon divalent cations and there are no loosely bound or soluble factors which are essential for mating to occur. Also, conjugation will only occur if the cells are forced onto a solid substrate and it is likely that transfer is only occurring between cells in most intimate proximity. The conjugal plasmid pT0105 is highly relaxable and cannot be isolated using conventional cesium chloride/ethidium bromide gradient protocols. Using a technique where the mating membrane is resuspended prior to incubation, transfer frequencies of 10^{-4}/recipient can be achieved in two hours. The presence of novobiocin before and during mating has been shown to affect transfer frequencies by two orders of magnitude (10^{-7} vs 10^{-5} in the absence of novabiocin). This is evidence in favor of replication as an essential element for DNA transfer in *Staphylococcus* as novobiocin is a DNA gyrase inhibitor. Finally, tetracycline has been shown to affect the frequency of transfer by an order of magnitude. This indicates that de nova protein synthesis plays a role in transfer, but is not absolutely essential. Investigations are currently underway to more completely characterize the role of protein, RNA and DNA synthesis in both the donor and recipient during transfer using antibiotics such as chloramphenicol and rifampicin.

9:30 INHIBITION OF EBV REACTIVATION IN P3HR-1 CELLS BY TRICYCLODECAN-9-YL XANTHOGENATE.

NATASHA B. HALASAL, DARLENE G. WALRO, AND KEN S. ROSENTHAL, UNIVERSITY OF AKRON, DEPT. OF BIOLOGY, AKRON OH 44325-3908 AND NEOUCOM, DEPT. MICR/IMM, BOX 95, ROOTSTOWN OH 44272.

The xanthate derivative, coded D609, inhibits RNA and DNA virus production and tumor promotion by an unknown mechanism but may involve inhibition of protein kinase(s) directly or phospholipase C-induced activation of protein kinases. In this study, we examined the effect of D609 on the phosphatidylinositol (PI) pathway by reactivating latent Epstein Barr virus (EBV) in P3HR-1 cells with either the phorbol ester TPA or the calcium ionophore A23187 in the presence of D609. An immunofluorescence assay was used to identify viral proteins and to quantify the number of cells containing reactivated EBV. Less than 0.5% of control cells or cells treated with 8 ug/ml D609 stained positive for virus whereas significantly more cells ($p < 0.5$) stained positive after treatment with 30 ng/ml TPA or 0.1 uM A23187. The percent of cells expressing reactivated EBV following treatment with TPA/D609 or A23187/D609 was significantly different from the percent of virus-positive cells following TPA and A23187 treatment but not significantly different from untreated control cells. These results suggest that D609 abrogates the diacylglycerol and calcium-mediated effects of the PI pathway and are consistent with the hypothesis that phospholipase C is a target of D609 activity.

9:45 GENETIC COMPLEMENTATION OF THE *LYMANTRIA DISPAR* NUCLEAR POLYHEDROSIS VIRUS.

KIMBERLY M FLAHERTY, OWU BOX 1122, DELAWARE OH 43015.

As the gypsy moth continues to spread across the United States, it is wise to consider more environmentally-friendly means of control. The Lymantria disbar nuclear polyhedrosis virus

(LdNPV) is specific only to the gypsy moth, causing a fatal systemic infection. As a result of growing the virus *in vitro*, several mutant strains have emerged that quickly take over the viral population, decreasing the effectiveness of the virus as a biological control. The Purpose of this project was to determine if the mutant strains could be combined in order to produce a functional virus. Several test crosses were set up and complementation and recombination events were documented using visual PIB counts and plaque assay. The results of these crosses have enable these mutants to be classified in several distinct complementation groups. The recombined viruses have aided in the mapping of several viral genes. In addition, these crossed viruses may be used to further increase the effectiveness of the LdNPV virus as a biological control in lieu of chemical insecticides.

10:00 INTER-SPECIES DIFFERENCES IN THE THYROID AND LIVER LEVELS OF THYROID HORMONES AMONG VERTEBRATES. ARMANDO G. AMADOR AND ROBERT D. HILGERS, DEPT. OBSTETRICS/GYNECOLOGY, SIU SCHOOL OF MEDICINE, SPRINGFIELD IL 62794-9230.

We have previously shown that intra-species differences in thyroid hormone levels exist in rats (Pittman et. 1993). Also, major differences in endocrine parameters occur among different species (Ewing et al, 1979; Huhtaniemi et al, 1982; Amador et al. 1986. 1990). These included differences in circulating thyroxine levels. The present study was undertaken to analyze the differed that might exist in thyroid hormone metabolism, among various species of vertebrates. Thyroid and livers from adult male and female Norway rats, Syrian hamsters, House mice, Guinea pigs, and Canada geese were obtained. Thyroids and liver fragments were homogenized. Tissue thyroxine (T4) and triidothyronine (T3) levels were then measured using solid-phase radioimmunoassays. Geese had the highest thyroid T4 levels, and in mice they were undetectable. Female rats had higher thyroid T4 than males, but otherwise no sexual dimorphism was detected in other species. Thyroid T3 levels were highest in rats and undetectable in mice. Male hamsters had higher thyroid T3 than females and the opposite was true for Guinea pigs. The thyroid T3/T4 ratio was higher in hamsters than in other species. Gender-related differences in this ratio was observed in rats and hamsters, with males having greater ratios than females. Male hamsters had the highest levels of liver T3, and female rats had the lowest. In all rodents, but not in geese, males had higher liver T3 concentrations than females. The present results indicate that there are inter- species and inter-gender differences in thyroid hormone levels. This gives further support to the importance of genomic regulation of thyroid hormones metabolism. These studies were supported by the SIU-OB/GYN Research Fund.

10:15 THE GENETIC FUNCTION OF INTRONS AS A MEANS OF REDUCING COPYING ERRORS. GERALD R. BERGMAN, PH.D., NORTHWEST STATE COLLEGE, 22-600 STATE RT. 34, ARCHBOLD OH 43502.

Two main divisions of DNA strands are introns and exons. The introns are large stretches of DNA with biological functions that have only recently been explored. Long called junk DNA because their function was unknown, the introns are removed by splicing enzymes before mRNA, rRNA and tRNA can complete their function. All genes start with exons, but have a variable number of introns within them. Introns are common in eukaryotes, and found in prokaryotes only in exceptional cases. Theories of intron function include they are relics of genes that have now become useless or redundant, or exist as a means to allow genetic diversification. A new theory by Shepherd proposes that they serve as redundancy for the purpose of error correcting to reduce the likelihood of mutations. Evidence for this position includes largely predictable correlations between introns and neighboring exons within a gene. The fact that a huge amount of energy is put into a complex mechanism to form the intron system argues that they have some important biological function. Shepherd's theory is that they serve a function similar to the error checking system built into nearly every electronic and digital transmission system. After the exons are checked, the redundant bits are then discarded. Research along this line was reviewed, concluding that the error checking system is a viable hypothesis that needs to be evaluated further.

10:30 *HERPES SIMPLEX* VIRUS: EXPRESSION OF VIRUS ENCODED dUTPASE. K. BECHER AND M.V. WILLIAMS, MOLECULAR, CELLULAR AND DEVELOPMENTAL BIOLOGY PROGRAM AND DEPT. OF MEDICAL MICROBIOLOGY AND IMMUNOLOGY, OHIO STATE UNIVERSITY, COLUMBUS OH. 43210.

Studies on the herpes simplex virus (HSV) encoded deoxyuridine triphosphate nucleotidohydrolase (dUTPase) have been hampered because it has not been possible to construct mutants of HSV that lack the virus encoded dUTPase and that simultaneously shut-off cellular dUTPase. To overcome this problem, a 1.7kb EcoR1 cDNA fragment of HSV-2 (strain 333) containing the dUTPase structural gene was cloned into the bacterial expression vector pGEX-3XdUT. Transformation of the recombinant plasmid (pGEX-3XdUT) into *Escherichia coli* (JM109) and subsequent induction of the glutathione-S-transferase gene resulted in the expression of a fusion protein with a molecular weight of 70,000. Enzymatic analyses demonstrated that there was significant levels of dUTPase activity in crude lysates from CJ236 a strain lacking dUTPase, transformed with pGEX-3XdUT when compared to lysates from CJ236 transformed with the parental plasmid or with a recombinant plasmid containing the HSV-2 DNA in the reverse orientation. These results demonstrate that this plasmid construct will be useful for determining genetic and biochemical properties of the HSV-2 encoded dUTPase.

10:45 PARAMUTATION, AN EPIGENETIC CHANGE ASSOCIATED WITH THE SHIFT FROM VEGETATIVE TO REPRODUCTIVE PHASES IN THE DEVELOPMENT OF THE MAIZE PLANT. BERNARD C. MIKULA, DEFIANCE COLLEGE, DEFIANCE OH 43512.

An assumption of Mendelian genetics is that both alleles in heterozygotes remain unchanged when tested in subsequent generations. Paramutation at the *R* locus in maize provides an exception to this assumption. When the R gene, a transcriptional activator responsible for kernel pigment, is made heterozygous with its allele *R-st*, all *R* genes undergo a change in expression. The change in *R*-gene expression is heritable in following generations. It has been assumed this change in *R*-gene expression takes place progressively throughout somatic development and appears as a tassel mosaic upon sampling of male gametes at maturity. Evidence will be presented to show that paramutation is controlled by light and temperature conditions within a four-day period at the time seedlings are shifted from the vegetative to the reproductive phase of development.

MOLECULAR BIOLOGY
01:30 PM - Saturday, April 23, 1994
Williams
Paul A. Fuerst, Presiding

1:30 SEQUENCE COMPARISONS OF THE HYPERTENSIVE AND NORMOTENSIVE Y CHROMOSOMES OF THE RAT. ELIZABETH GRAHAM, AMY MILSTED AND MONTE TURNER, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

The Y Chromosome of the Spontaneously Hypertensive Rat (SHR) has a gene that increases blood pressure. There are currently no molecular markers for the rat Y chromosome. Genetic divergence of nuclear genes between the SHR and the Wistar-Kyoto rat (WKY) are not consistent with divergence measured by comparing mitochondrial DNA. The comparison of Y chromosomes from the two strains will give a estimation of paternal lineage divergence to compare to the maternal divergence of the mitochondrial DNA. We have used the PCR based markers of the human Y chromosome map to identify and compare the SHR and WKY Y chromosomes. Some primers, from the human Y chromosome map, amplify bands which appear in the SHR or WKY male DNA, but not in the female DNA. These bands are assumed to be of Y chromosome origin. We have isolated these male specific bands of the human SRY gene primers from SHR and WKY. These were sequenced using the dideoxy chain-terminating procedure and TAO polymerase. Sequences from SHR and WKY were compared to the sequence of the mouse SRY locus, to insure the same locus was being amplified in the rat. Sequences were then compared between the SHR and WKY strains to obtain a index of Y chromosome divergence between these two strains.

1:45 THE DIRECT EFFECTS OF ANGIOTENSIN II ON PROTO-ONCOGENES, c-JUN, c-FOS AND ZINC FINGER PROTEIN EGR-1 IN PERFUSED, ISOLATED MURINE HEARTS. MIKE SHIN, DANIEL ELY, AMY MILSTED AND MONTE TURNER, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

Recent research in the field of cardiovascular molecular biology has provided evidence via cell culture for a role of the peptide angiotensin II (Ang II) in myocyte hypertrophy. Ang II acts through the G protein signaling cascade triggering a nuclear response resulting in synthesis of appropriate proteins for myocyte hypertrophy. Expressions of nuclear-acting proto-oncogenes (p-onc) appears to be the earliest indicator of ensuing hypertrophy. In this study, we used the p-oncs, c-jun, c-fox and zinc finger protein egr-1 as probes to determine gene levels in mRNA of rat hearts. Twenty hearts of 15 week old Wistar-Kyoto normotensive rats were used. Ten hearts were perfused with 10^{-6} M concentration of Ang II via the Langerdorff isolated heart procedure; control groups received perfusate alone. P-onc expression was quantified by measuring amounts of proto-oncogene mRNA using dot blots. The dot blots were hybridized with ^{32}P-labeled nick translated cDNA probes for respective p-oncs. Quantitative analysis of the dot blot hybridizations was carried out by imaging and detection on the BetaScope analyzer. Preliminary investigations show 15% to 25% increase in p-onc levels as compared to the controls. Although still an ongoing investigation, evidence suggests Ang II as a direct growth factor for cardiac hypertrophy.

2:00 COMPARISON OF HYPERTENSIVE AND NORMOTENSIVE Y CHROMOSOME. ASIF QADRI, MONTY MONTGOMERY, DAN ELY AND MONTE TURNER, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 4432-3908.

The objective of this research was to identify and compare Y chromosome DNA markers from hypertensive (SHR) and normotensive (WKY) rat Y chromosomes. PCR primers specific for the human Y chromosome were used to amplify rat DNA. Annealing stringencies were reduced and the presence of male specific bands was taken as evidence of Y chromosome amplification and the presence of a rat Y chromosome marker. Amplification patterns for these primers were compared in SHR and WKY males. A total of 12 human Y chromosome primers were tested. Only four of the primers failed to amplify male specific bands in the rat DNA. Of the eight rat Y chromosome markers only two were amplified and the same in SHR and WKY males. Three primers identified male specific bands in either SHR or WKY and these bands were not found in the other strain. Three primers amplified male specific bands in either SHR or WKY and the same size bands were found in the other strain but not male specific. Using the human Y-specific primers is a way to identify Y chromosome markers in other species. The hypertensive and normotensive Y chromosomes have a number of mutations that separate them. The existence of male specific bands in one strain not male specific in the other strain could indicate the existence of a translocation or inversion on the hypertensive Y chromosome.

2:15 EFFECT OF DIFFERENT PROTOCOLS ON THE REPRODUCIBILITY OF RAPD PRIMERS.

Min Zhang, Debbie Steidl, Daniel Ely and Monte Turner, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Many labs using RAPD primers have questioned the reproducibility of amplification patterns using this technique. The objective of this study was to vary the concentrations of various components of the reaction mixture and compare amplification patterns. Amplifications were done using nine different RAPD primers. Each reaction was done in a total volume of 16.5 micro liters. DNA, $MgCl_2$, 10X buffer and TAQ polymerase concentrations were varied individually, holding the concentration of the other components constant. There was no difference in the amplification patterns when DNA concentrations were varied from 20-100 nanograms per reaction. $MgCl_2$ concentration from 2 to 5 mM doesn't change the results, the intensity of the bands vary but new bands do not appear. Primer concentrations from 0.5 micromolar to 1.5 micromolar do not affect results. Changing the TAQ buffer concentrations from IX -0.3X also does not affect results. TAQ concentrations from 0.1 to 1.5 units per reaction does not affect the results. We have tried to vary parameters within a range expected if small experimental errors in the procedure had occurred, rather than concentrations that were experimentally unrealistic, and within this range the RAPD amplifications were repeatable as far as the sizes of the bands amplified.

2:30 MILK AS A FACTOR IN THE DEVELOPMENT OF HYPERTENSION IN THE SPONTANEOUSLY HYPERTENSIVE RAT.

Monty Montgomery, Dan Ely and Monte Turner, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Many important factors have been found which are passed to the infant in the mothers milk. For example immunoglobulins in the milk infer immunity to the nursing infant. These factors are known to have great influence on the health and well-being of the developing infant. Cross-fostering experiments involving Spontaneously Hypertensive Rats (SHR) and normotensive Wystar-Kyoto (WKY) have shown strongly that milk factors from WKY mothers can partially ameliorate hypertension in the SHR rat. The purpose of this study is to determine which factors may be involved in the development of hypertension and passed to the offspring in the mothers milk. The first step that had to be accomplished, before any preliminary analysis of the milk could occur, was to determine the best possible way to obtain milk samples from nursing dams. This was accomplished through the design of a milking device which was a modification of a device discovered in a literature search. Several milking procedures were tried with anesthesia to prevent stress related factors in both the mother and researcher. The best samples were obtained with brevitol anesthesia and oxytocin as a muscle relaxant to improve flow. Milk once isolated can be used to compare the milk of SHR and WKY for factors which are present in one strain but not the other strain.

2:45 CHARACTERIZATION OF *STAPHYLOCOCCUS EPIDERMIDIS* STRAIN FLO192.

Dawn M. Brown and L. Glatzer, Dept. of Biology, University of Toledo, Toledo OH 43606.

The properties of *Staphylococcus epidermidis* strain FLO192 are under examination. This strain was isolated from a post-cardiac surgery wound of a patient treated heavily with the quinolone Ciprofloxacin. FLO192 possesses four plasmids with sizes of approximately 27 kb, 4.4 kb, 2.6 kb, and 2.3 kb. pTo117, the largest plasmid, is self transmissible and provides resistances to aminoglycosides, trimethoprim, penicillin/ampicillin, and ethidium bromide. The strain is resistant to Ciprofloxacin (MIC 4.0 ug/ml) and this resistance appears to be chromosomal as it is not transferred. FLO192 is also tetracycline resistant (MIC 4.0ug/ml) and we believe this is bourne on a nontransmissible plasmid (pTO118). pTO117 differs tram other gentamicin resistant plasmids, such as pTO105 (Toledo isolate), in size but does share some restriction fragment patterns. pTO117 has numerous restriction sites and does not restrict with common restriction enzymes such as PvuI and SalI. Generally, it has been shown that large aminoglycoside resistance plasmids are unstable. This problem may be enhanced when strains of *S. aureus* harbor these plasmids. Studies of spontaneous curing show that over 20 generations, FLO192 retains pTO117 with only 2.2% loss. This is lost when pTO117 is transferred to S aureus RN450/pTO117 (16.7%). pTO117 transfer properties will be described.

3:00 DEVELOPMENT OF AN EFFICIENT TECHNIQUE TO MEASURE MAJOR HISTOCOMPATIBILTY GENE POLYMOPHISM IN FISH AND OTHER WILDLIFE.

Tammi R. James, Michelle, R. Pignotti, and Simon R. Lawrance, Otterbein College, Westerville OH 43081.

Histocompatibility genes are the most polymorphic genes known. We have focused on developing a technique to measure polymorphism of histocompatibility genes in species of fish and other wildlife. To study polymerphism, carp and human genomic DNA were isolated and purified. Diluted samples of DNA were amplified by the polymer axe chain reaction using primers corresponding to nonpolymorphic regions of the histocompatibility gene. Restriction enzymes were added to the amplified products, cutting the gene into smaller fragments. The formed fragments were separated by polyacrylamide gel electrophoresis, transferred to nylon filter paper and hybridized with a labeled histocompatibility probe. This process allowed for visualization of the characteristic bands of the amplified gene, and produced a "histocompatibility fingerprint". Through a comparative study of these fingerprints, we will obtain a measure of histocompatibility gene polymorphism within and between species. These data will be used to estimate sizes of the founder populations, the extent of hybridization between species, and will also give insight into intraspecies genetic diversity, which is an important component of biodiversity.

3:15 DNA SEQUENCES OF THE *glpK* AND *glpD* GENES, AND TWO POSSIBLE TRANSPORT GENES, MEMBERS OF A GLYCEROL METALIZING OPERON IN *COXIELLA BURNETII*?

Bohai Wen and Paul A. Fuerst, Dept. of Molecular Genetics, Ohio State University, Columbus OH 43210.

Coxiella burnetii, a Gram-negative obligate intracellular bacteria, is the etiological agent of Q fever. The metabolic capabilities of *C. burnetii* appear to have several unusual features. Glutamate, rather than glucose, is the main energy source available to the cell. In studying genes related to membrane transport, we identified a 3.7 kilobase DNA fragment which contained four open reading frames. The four open reading frames have been found to have homology with genes in other bacteria. Two of the ORFs are homologous to members of the *glp*-operon of *E. coli*, the glycerolkinase (*glpk*) and glycerol-3-phosphate dehydrogenase (*glpd*) genes. The C. burnetii sequences were compared with homologous sequences from *E. coli* and *B. subtilis*. The nucleotide similarity of *C. burnetii glpk* with *E. coli glpk* was 0.55, while comparisons with *B. subtilis glpk* showed nucleotide similarity of 0.57. Equivalent comparisons of amino acid sequences were 0.51 and 0.53. When E. coli and B. subtilis are compared, nucleotide and amino acid similarity are 0.63 and 0.62. For *glpd*, the *C. burnetii* sequence had nucleotide similarity of 0.52 with *E. coli* and 0.45 with *B. subtilis*, while amino acid similarity was 0.54 and 0.37, respectively. Similarity for the *E. coli-B.subtilis* comparison was 0.41 (nucleotide) and 0.33 (amino acid). The remaining two ORFs were identified as transport proteins. These sequences were found to have highly significant sequence similarity to the *nodJ* and *nodI* transport proteins of *Rhizobium*. The conservation of structure and orientation of the genes suggests that they are part of a conserved ATP-binding active transport system.

3:30 MOLECULAR ANALYSIS OF THE UNIQUE LYSINE GENES OF *CANDIDA ALBICANS*.

Richard C. Garrad and J,K, Bhattacharjee*, Dept. of Microbiology, Miami University, Oxford OH 45056.

Lysine is synthesized via the α-aminoadipate pathway, an unique pathway present in fungi. The pathway consists of eight enzyme steps and more than ten unlinked genes in *S. cerevisiae*. This pathway is not present in bacteria, plants or humans. The presence of the α-aminoadipate pathway has been demonstrated in several pathogenic fungi. The LYS1 gene of Candida albicans which encodes saccharopine dehydrogenase, the last biosynthetic enzyme of the α-aminoadipate pathways was originally cloned by functional complementation of a lys1 mutant of S. cerevisiae by Goshorn and Scherer (1992). The subcloned LYS1 gene lies within a 1.8kb fragment within plasmid YpBRG2. The nucleotide sequence of this fragment reveals upstream (including the GCN4 recognition sequence) and downstream regulatory sequences and an open reading frame coding for a protein of 382 amino acids. The fragment has functional activity when used to complement a *lys1* mutant of *S. cerevisiae*. Sequence comparisons reveal the ORF to have 60% identity at the nucleotide level and 71% similarity at the amino acid level to the isofunctional LYS5 gene of *Yarrowia lipolytica*. A peptide of 11 amino acids essential for saccharopine dehydrogenase activity in S cerevisiae is completely conserved in the LYS1 and LYS5 encoded proteins from *C. albicans* and *Y. lipolytica*. The unique nature of lysine biosynthesis in fungi may be potentially useful in controlling the growth of these fungi. The presence of conserved DNA sequences within the genes of the α- aminoadipate pathway may be useful as target sequences for the detection of these organisms *in vivo*.

3:45 MOLECULAR EVOLUTION OF rRNA GENES IN TICK BORNE AND INSECT BORNE *RICKETTSIA*, AN OBLIGATE INTRACELLULAR BACTERIA.

Diane R. Stothard and Paul A. Fuerst, Dept. of Molecular Genetics, Ohio State University, Columbus OH 43210.

Members of the eubacterial genus *Rickettsia* belong to the α-subgroup of the phylum Proteobacteria. They are small, generally rod-shaped, gram-negative bacteria and are obligately intracellular. Several species of *Rickettsia* cause diseases in man, including Rocky Mountain Spotted Fever (RMSF) and epidemic typhus. Other non-pathogenic forms exist which are not known to infect man and/or cause disease. Rickettsiae have historically been classified by vector host and immunological cross-reactivity. The two main biotypes are the typhus group (TG), carried in insects, and the spotted fever group (SFG), found in ticks. However, the most common species endemic to North America, *R. bellii*, does not fit neatly into either category. This research focuses on molecular approaches to the phylogeny of the genus *Rickettsia*. Specifically, there are three aims to this project; 1) to determine the phylogenetic relationship between pathogenic and non-pathogenic species of SFG Rickettsia ; 2) to determine the relationship of R. bellii to SFG and TG species; and 3) to determine which arthropod vector was exploited first, the tick or the insect. Data on the complete gene sequence has been collected for both the 16s and 23s rRNA genes of the SFG species *R. rickettsii, R. conorii, R. sibirica, R. parkeri, R. australis* and *R. rhipicephali*, and the *TG species R. prowazekii* and *R. typhi*. Both gene sequences have been studied in R. bellii. The data indicate that *R. bellii* diverged just prior to, or at the time of the split of the genus into the TG and SFG. Overall genetic differentiation in *Rickettsia* is small, with no species showing more than 1.7% and 3.2% divergence from other members of the genus for the 16s and 23s rRNA genes.

4:00 ISOLATION AND MAPPING OF A PEROXIDASE GENE RELATED TO FLOODING TOLERANCE IN CORN.

Tara T. VanToai. USDA-ARS, Soil Drainage Research Unit, 590 Woody Hayes Drive, Columbus OH 43210.

Flooding tolerance in corn increases 10-fold in response to treatment with 100 μM ABA. ABA-treated corn roots show typical morphological changes due to lignification. A peroxidase clone, pCPOX1, was isolated from an ABA-treated corn root cDNA library and sequenced. The clone pCPOX1 shares the same conserve sequences with other known plant peroxidases. However, the similarities in amino acid sequences between pCPOX1 and other known plant peroxidases only range from 27.9% (barley) to 39.4% (turnip). Northern blot analysis shows that the cloned peroxidase gene is inducible by ABA treatment. The clone pCPOX1 hybridized

predominantly to one DNA fragment in Southern blot analysis. The role of the cloned peroxidase gene in root lignification and the flooding tolerance response in corn remains to be confirmed.

4:15 STUDY OF VIROLOGY AND SEROLOGY OF EPIDEMIC OF EQUINE INFLUENZA IN NORTH INDIA. GURKIRPAL SINGH, DEPT. OF VET. BACT. & VIROLOGY, PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA-141004, INDIA, FULBRIGHT VISITING FELLOW, FOOD ANIMAL HEALTH RESEARCH PROGRAM, OARDC, OSU, WOOSTER OH 44691.

In an epidemic of equine influenza which occurred in India in the year 1987, A/eq-1 and A/eq-2 viruses were isolated. The A/eq-1 isolate (A/eq/Ludhiana/5/87) was found to be antigenically similar to A/eq/Prague/1/56. The involvement of A/eq-1 virus, in addition to A/eq-2, was unusual. In haemagglutination inhibition (HI) tests with a panel of monoclonal antibodies, A/eq-2 isolates (3/87 and 8/87) seemed indistinguishable from A/eq/Miami/1/63 strain. In few affected animals, the antibody response in sera collected at different times was determined. The results showed significant decreases in antibody titres between first serum (early convalescent phase/late acute phase) and the serum at 4-5 months after the onset of illness against A/eq-2 virus. However, with A/eq-I viruses, the antibody response was stronger and persisted at similar levels except in one case where significant decline was noted. The concurrent isolation of both types of equine influenza virus together with the serological pattern in affected animals indicated that during the epidemic of equine influenza, both types of equine influenza virus were active in the same equine population, in North India. It appeared to be the first instance of confirmed existence of both types of equine influenza virus in the same epidemic.

4:30 ISOLATION OF *MANDUCA SEXTA* DNA FRAGMENTS WITH HOMOLOGY TO THE *DROSOPHILA* GENE *BICOID*. RICHARD M. CLARK AND DR. DAVID J. MARCEY, KENYON COLLEGE, GAMBIER OH 43022.

In *Drosophila* (a Dipteran), very early development is directed by maternal genes whose transcripts or products are subcellularly localized within the oocyte. Whether similar maternal genes specify positional information in insect taxa other than Diptera is unclear. We have attempted to isolate a gene with homology to the *Drosophila* gene *bicoid (bcd)* from the Lepidopteran *Manduca sexta*. In *Drosophila, bcd* mRNA produced in nurse cells moves into the oocyte during oogenesis and is localized to the anterior pole of the developing egg. Following fertilization, translation of the localized RNA source produces a gradient of *bcd* protein which specifies anterior cell identity in a concentration dependent manner. Using the polymerase chain reaction, we have amplified a fragment from *Manduca* ovarian cDNA and two fragments from *Manduca* genomic DNA which hybridize to bcd cDNA. Sequence data for the PCR products with homology to the bcd gene will be presented, as will a description of the temporal distribution of the corresponding gene during early *Manduca* embryo genesis.

ZOOLOGY - ANIMAL SCIENCE
1:30 PM - Saturday, April 23, 1994
Seneca
Paul M. Daniel, Presiding

1:30 INTRASPECIFIC NEST PARASITISM IN WOOD DUCK POPULATIONS NESTING IN BOXES. COURTENAY N. WILLIS, DAVID W. WALLER, AND LOWELL P. ORR, DEPT. OF BIOLOGICAL SCIENCES, KENT STATE UNIVERSITY, KENT OH 44242.

Intraspecific nest parasitism, where a female lays eggs in the nest of a conspecific, occurs frequently in populations of Wood Ducks (*Aix sponsa*) nesting in boxes. To determine the 1) percentage occurrence of parasitism, and 2) influence of parasitism on clutch size, number of hatchlings, and percentage hatch, nest boxes were monitored at Berlin Wildlife Refuge (50 nests) and Mosquito Creek Wildlife Refuge (57 nests) in northeastern Ohio during Spring of 1993. For the 27 "successful" nests (those with at least one hatchling), parasitism occurred in 6/10 nests at Berlin and 12/17 nests at Mosquito Creek. Clutch size increased significantly in parasitized vs. normal nests (Berlin, 18.2+/-1.9 vs. 12.3+/-1.3 eggs; Mosquito Creek, 23.6+/-5.4 vs. 10.7+/-1.2 eggs)(ave+/-SD). Number of hatchlings increased in parasitized vs. normal nests (Oberlin, 14.6+/-4.0 vs. 9.5+/-3.1 chicks; Mosquito Creek, 14.7+/-5.5 vs. 8.0+/-3.0 chicks). Percentage hatch decreased in parasitized (60%) vs. normal nests (74%) at Mosquito Creek, but remained the same (80%) for both at Berlin.

1:45 DAILY ACTIVITY PATTERNS AND MIST NET CAPTURES OF FALL MIGRANT LAND BIRDS. JENNIFER K. HATHAWAY, MANOMET BIRD OBSERVATORY, WITTENBERG UNIVERSITY, P.O. BOX 6100, SPRINGFIELD OH 45501-5100.

Activity patterns of birds vary throughout the day. Birds during migration can be classified as either nocturnal or diurnal migrants. Using mist net capture data from Manomet Bird Observatory (1970-1992) and fall field observations, I compared the patterns of captures, observations, and behaviors of birds throughout the daylight hours. Capture patterns for nocturnal and diurnal fall migrants correlate with previous studies of spring migration, and summer and winter activity level studies. Highly significant differences were found to exist among observed behaviors over the course of the day at both the species level, and nocturnal and diurnal categories. Mist net capture patterns of Blue Jays (*Cyanocitta cristata*) and Gray Catbirds (*Dumetella carolinsis*) appear to result from interaction and movement behaviors. Black-capped Chickadee (*Parus atricapillus*) capture patterns seem to occur due to foraging behaviors. No observed behavior patterns could explain the changes that occurred in nocturnal and diurnal capture patterns. Mist net capture and observation detectability patterns tend to vary from each other only slightly over the course of the day.

2:00 BULLFROG (*RANA CATESBEIANA*) LOCATION AND BEHAVIOR DURING HIBERNATION. NICHOLAS ZARLINGA, SCOTT ORCUTT, AND JERRY STINNER, DEPT. OF BIOLOGY, UNIVERSITY OF AKRON, AKRON OH 44325-3908.

It is generally well known that many ranid anurans overwinter submerged in water. However, little has been published on their behavior or location during winter. Some authors suggest that frogs remain inactive (torpid) in or on the bottom sediment which, if true, could expose them to anoxia and freezing, particularly in shallow ponds. The purpose of the study was to determine if hibernating aquatic frogs are torpid. Six adult bullfrogs at two ponds (~0.25 ha each) in Summit County OH, were followed through a hibernation period in 1991/1992 by means of radio transmitters. During November and December, the frogs left their release sites and moved from 33 to 96 m to overwintering areas. Five of the frogs overwintered in relatively shallow areas near small inlet streams in the NW corner of the ponds. The remaining frog over wintered 1-2 m off the west shore. Collectively, the six frogs were located 208 times and were nearly always submerged. Frogs moved about even during the coldest periods. They were seen floating at the water's surface or sitting on the bank on only 10 occasions. Bullfrogs that were observed submerged on the pond bottom were not buried or covered by silt. This study suggests that adult bullfrogs prefer relatively warm, shallow water for hibernacula and that they are not torpid. Future studies of thermal and dissolved O_2 gradients are needed to determine their importance to over wintering behavior in bullfrogs.

2:00 POSSIBLE LUNAR CYCLES IN NESTING LOGGERHEAD SEA TURTLES ON KEY ISLAND, NAPLES, FLORIDA. JOHN M. SPANO AND E. BRUCE MCLEAN, DEPT. OF BIOLOGY, JOHN CARROLL UNIVERSITY, UNIVERSITY HEIGHTS OH 44118.

Preliminary data from the 1993 nesting season indicate a possible relationship between lunar cycles and nesting patterns of the Loggerhead Sea Turtle (*Caretta caretta*). Sea turtle nesting (n=103) was observed at Key Island during the nights of 16 May through 27 July, 1993. In June and July, nights of the full moon and adjacent nights had no nesting activity except one incident when the moon was below the tree line at the time of beaching. These data and references indicating that sea turtles are deterred from nesting by artificial light suggest an adaptive negative response to light. Additional data are used to test this hypothesis.

2:15 A FIELD STUDY OF THE MOVEMENT, HIBERNATION, AND HOME RANGES OF EASTERN BOX TURTLES (*TERREPENE C. CAROLINA*) IN A PORTION OF THE MIAMI WHITEWATEER FOREST, HAMILTON COUNTY, OHIO. PAUL M. DANIEL, DENNIS L CLAUSSEN, AND NADINE A ADAMS, DEPT. OF ZOOLOGY, MIAMI UNIVERSITY, OXFORD OH 45056.

This study involved six turtles equipped with Model L Mini-Mitter radio transmitters captured, released and traced over a three year period in a combined woodland and grassland habitat in a Hamilton County, Ohio park. Maps were prepared of the study area which took advantage of a little used section of the park containing a trail constructed with braille signs and a wire guide for the blind which was no longer used. This provided an ideal set of reference points to monitor and record turtle positions. From this information home ranges were constructed and hibernation sites noted. Some turtles remained close to the site of original capture for the entire study period; others ranged away from the original study area and were lost, and others had large home ranges within the study area. A thermocouple was attached to the transmitter on each turtle and sub carapace temperatures were recorded each time a turtle was located. Soil and air temperatures in close proximity to the turtle were also recorded.

2;45 GENETIC VARIATION AND DIVERGENCE BETWEEN POPULATIONS OF THE ENDANGERED FISH, *FUNDULUS DIAPHANUS MENONA*. DUSTIN B. SEARS, MALCOLM D. SCHUG AND PAUL A. FUERST, DEPT. OF MOLECULAR GENETICS, OHIO STATE UNIVERSITY, COLUMBUS OH 43210.

Since 1920 the western banded killifish *Fundulus diaphanus menona* has decreased greatly in abundance in Ohio. Currently, Ohio considers it a state endangered species. The decline has resulted in extirpation of populations throughout the northern part of Ohio. Only the Miller's Blue Hole population of Sandusky County is known to survive. The Ohio Department of Natural Resources has developed a restoration plan for the species. As part of this preservation effort, two derived populations have been established at the Columbus Zoo and ponds of the ODNR Xenia Fish Hatchery. Levels of molecular genetic variability within the remaining natural population and between the stock populations was examined by protein electrophoresis of twenty enzyme systems, representing 35 genetic loci. Heterozygosity is very low in all populations. The Miller's Blue Hole population is not variable for any locus studied. A comparison was done between the Miller's Blue Hole population and other natural populations from the species range around the Great Lakes, to determine the extent of divergence between the Ohio population and populations of *F. diaphanus menona* across its geographic range. Preliminary results detected allelic variation in these populations, but still at low levels, and high genetic similarity between all populations. We are extending our study to incorporate nuclear gene markers, including RAPD markers and VNTR typing. This information will better indicate the extent to which populations from across the species range can be used in restoration efforts of this endangered species. (Supported by a grant from ODNR-Div. Wildlife).

3:00 MOLECULAR GENETIC DIFFERENTIATION BETWEEN NATURAL AND STOCK POPULATIONS OF THE ENDANGERED LAKE

STURGEON (*ACIPENSER FULVESCENS*) REVEALED USING VNTR DNA MARKERS. MALCOLM D. SCHUG, BRADY PORTER, PAUL A. FUERST, PATRICIA PARKER AND TED M. CAVENDER, DEPT. OF ZOOLOGY, OHIO STATE UNIVERSITY, 1735 NEIL AVE., COLUMBUS OH 43210.

Before 1900, the lake sturgeon (*Acipenser fulvescens*) was a common species throughout the Great Lakes. In the late 19th and early 20th century, overfishing and construction of dams which blocked spawning grounds decimated the population. The lake sturgeon is now considered an Ohio endangered species. As part of a restoration effort, a stock population of lake sturgeon has been established by the Ohio Dept. of Natural Resources using fish from Wisconsin. The extent of genetic variability in the stock population, and genetic similarity of the stock to the remnant natural population of sturgeon in Lake Erie is unknown. To determine levels of genetic variability among natural and stock populations, we examined rapidly evolving VNTR loci, referred to as DNA fingerprints. Five wild caught fish and five fish from the stock population were compared. DNA was digested with the restriction enzyme HaeIII, restriction fragments separated by electrophoresis, and hybridized with two VNTR probes, Jeffrey's 33.15, and M13. An average of 41 bands were scored per individual. Genetic similarity indices within the natural population were 0.54+/-0.08, and 0.23+/-0.12, respectively. Equivalent values within the stock populations were 0.86+/-0.06, and 0.51+/-0.08. Genetic similarity indices for the two probes between natural and stock populations were 0.44+/-0.1, and 0.19+/-0.06. The results indicate that individuals in the stock population of lake sturgeon are closely related and should not be used as the sole genetic source of stock to be reintroduced to natural populations in Lake Erie. (Supported by a grant from ODNR/Div. Wildlife).

3:15 MOLECULAR EVIDENCE FOR DISCRETE BREEDING STOCKS OF WALLEYE (STIZOSTEDION VITRUEM) IN THE MAUMEE AND SANDUSKY RIVERS. ROBERT MERKER, JOSEPH FABER, CAROL STEPIEN, R. C. WOODRUFF DEPT. OF BIOLOGY, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

We have obtained molecular evidence using mitochondrial DNA (mtDNA) restriction site variation supporting the existence of separate breeding stocks of walleye between the Maumee and Sandusky rivers. Three separate regions of the mtDNA (1. D-loop region, 2. ND3, ND4L, and ND4 genes, and 3. The 12s and 16s rRNA genes) were amplified using the Polymerase Chain Reaction (PCR) technique. These amplifications were digested with nine different four-base cutting restriction enzymes and were resolved on 9% polyacrylamide gels. Regions 1 and 2 produced restriction fragment length polymorphisms (RFLPs) and revealed a total of five different haplotypes. Each river displays a particular frequency pattern of each of the five haplotypes. Most of the Maumee river wall eye (85%) are split between two main haplotypes, with the rest of the fish possessing either one of two rarer haplotypes. In the Sandusky, 68% of the fish have one of the main haplotypes that is found in the Maumee. The other main haplotype is only seen rarely in the Sandusky. The other two rare Maumee haplotypes are also seen as rare haplotypes in the Sandusky. Furthermore, 10% of the Sandusky walleye have a rare haplotype that has not yet been observed in the Maumee. None of the most frequent haplotypes were found to be exclusive to either of the rivers. These results show a significant difference between Maumee and Sandusky mtDNA haplotype frequencies, suggesting that these two populations do exist as separate breeding stocks. We have also identified a unique pattern of tandemly repeated base pair sequences within the D-loop region of the mtDNA. Additional DNA sequence results from the D-loop region will determine if there are differences in the frequency of the repeated base pair sequence between the rivers as well as determine any sequence variability. These results will help us to discern the genetic variability in these fish, which is key to maintaining the diversity necessary for successful fisheries and ecological management.

3:30 ALLOZYME VARIATION IN WILD AND CAPTIVE STOCK POPULATIONS OF THE LAKE STURGEON, *ACIPENSER FULVESCENS*. BRADY A. PORTER, MALCOLM D. SCHUG, PAUL A. FUERST, AND TED M. CAVENDER, DEPT. OF ZOOLOGY, OHIO STATE UNIVERSITY, 1735 NEIL AVE., COLUMBUS OH 43210.

Before 1900 the lake sturgeon, *Acipenser fulvescens* was an important component of the Great Lakes ecosystem. Unfortunately, aspects of the lake sturgeon's biology rendered it susceptible to commercial over exploitation, from which it has never recovered. As part of a plan to restore the species to Lake Erie, the Ohio Department of Natural Resources has requested a genetic study of the remnant wild population of lake sturgeon in Lake Erie, as well as available captive stocks. Individuals were collected from Lake St. Clair and Lake Erie, and from captive stocks maintained by the ODNR. Protein variability was assessed using allozyme electrophoresis, performed in horizontal starch gel and cellulose acetate media to determine the genetic composition and diversity of the sturgeon populations. Eight of eighteen enzymes which could be resolved showed variability between the wild population and the hatchery stock. Individuals from the captive raised stocks appear to be more homogeneous than those obtained from natural populations. Despite smaller sample sizes, the sample from the two natural populations include several genotypes not present in the larger sample from captive stocks. These data, in combination with other genetic information, suggest that the available captive stock may not be appropriate as a sole source of restocking for the restoration of Lake Erie's sturgeon population. Expansion of the genetic studies to larger samples, and to include other remaining natural populations of lake sturgeon is recommended. (Supported by a grant from ODNR-Div. Wildlife).

3:45 QUALITATIVE ANALYSIS OF THE HARBOUR ARCHAEOLOGICAL SITE (AD 1100) AT SANDUSKY, OHIO. TED M. CAVENDER AND JONATHAN E. BOWEN, MUSEUM OF BIOLOGICAL DIVERSITY, OHIO STATE UNIVERSITY, COLUMBUS OH 43212.

An unusually large quantity of fish skeletal remains was recovered at the Harbour Site by Heidelberg University archaeologists under the direction of Michael Pratt. This material represents a shallow water, near shore, Sandusky Bay fish assemblage with at least 25 species tentatively identified. Many small and medium sized fishes were present along with some very large individuals. The great size variation and exceptional diversity found in the material indicates probable capture by trap or seine, a hypothesis that is supported by the recovery of many net sinkers at the site. Collection areas with relatively firm, unobstructed bottom conditions were probably selected close to the village. The dominance of adult pumpkin seed sunfish suggests these fish were taken during the early summer spawning season when adults are easily captured in shallow water by seining. Some open water species were present but most share an affinity with the shallow, weedy-margin habitat of Sandusky Bay. Other vertebrates identified at the site such as muskrats, ducks, turtles, and frogs agree with the fishes in identifying the habitat sampled. Preliminary work at identification suggests the following fish species may have been present in the examined material: longnose gar, bowfin, grass pickerel, northern pike, muskellunge, cisco, golden shiner, chubsucker, spotted sucker, silver redhorse, river redhorse, golden redhorse, short head redhorse, channel catfish, brown bullhead, yellow bullhead, black bullhead, white bass, rockbass, pumpkinseed, bluegill, smallmouth bass, largemouth bass, white crappie, yellow perch, walleye and drum.

Earth and Space Sciences Division

EARTH AND SPACE SCIENCE - GEOLOGY
9:00 AM - Saturday, April 23, 1994
Wood
C. Scott Brockman, Presiding

9:00 ANCIENT DNA FROM NON MINERALIZED FOSSILS AND ITS APPLICATIONS IN EARTH SCIENCES. HONG YANG AND EDWARD M. GOLENBERG, DEPT. OF BIOLOGICAL SCIENCES, WAYNE STATE UNIVERSITY, DETROIT MI 48202.

The polymerase chain reaction (PCR) allows us to generate large quantities of specific genes from DNA samples derived from small amounts of degraded, nonmineralized tissues preserved in the geological record. Successful extraction, amplification, and subsequent sequencing of ancient DNA are largely dependent upon the quality of ancient materials that survived from complete decay and/or mineralization. Fossil materials that are suitable for ancient DNA study range from plant tissues to animal bones found in various paleoenvironments. Study of DNA-bearing plant fossils in Tertiary lacustrine deposits in Clarkia of northern Idaho suggests that preservation of DNA and other biomolecules is largely taphonoic-dependent. Unique taphonomic process (e.g. unseasonal shedding, wind transport, light diagenesis) in favorable environments (e.g. anoxia, fast burial, fine sediments) were associated with the DNA-bearing soft plant tissues. Ancient DNA sequences can be verified by comparing contemporary sequences that are related to the targeted ancient taxa. Ancient DNA study provides unique genetic information of past organisms, and holds potential applications in various aspects of earth sciences.

9:15 PHYSICAL GEOLOGY IN HIGH SCHOOL FOR COLLEGE CREDIT: THE WOOSTER AND ORRVILLE HIGH SCHOOLS COLLEGE OF WOOSTER CONNECTION REVISITED. RICHARD STORCK, WOOSTER HIGH SCHOOL, BOB SHONK, ORRVILLE HIGH SCHOOL, AND F. W. CROPP, GEOLOGY DEPT., COLLEGE OF WOOSTER. 101 WEST BOWMAN ST., WOOSTER OH 44691.

Since 1986, The College of Wooster has granted one course (four semester hours) of college credit to selected 12th grade honor students from Orrville High School and Wooster High School who have completed a Physical Geology class specially designed by these three schools. In addition to the geology class at their high school, the students sit in on the Physical Geology class at The College of Wooster, follow the same college syllabus, and take the same final exam as the college classes. Each member of the college geology faculty presents at least one lecture to the high school classes each year, and the students attend the guest lectures sponsored by the college geology department. This program elevates the importance of the Earth Sciences at the high school level and encourages students to consider a major in geology or related fields. The collaboration between high school and college geology teachers has built a partnership of geologic education which has been of great benefit to both high schools and the college.

9:30 EARLY USES OF CERAMICS AND BUILDING STONES IN DOWNTOWN TOLEDO, MARK J. CAMP, UNIVERSITY OF TOLEDO, DEPT. OF GEOLOGY, TOLEDO OH 43606.

An early use of dimension stone in Toledo, OH was in the construction of locks on the Miami and Erie Canal in the late 1830s - early 1840s. Silurian bedrock was pried from the channel of the Maumee River upstream of Perrysburg and Maumee and hauled to the canal sites for placement. Upon completion, canal packets brought blocks of Silurian Dayton Limestone quarried at Dayton and Piqua to the city for use in bridge and foundation construction. Cobblestones collected from glacial and fluvial drift became the pavement of many early streets. Those in the Vistula district of which only Cedar Street survives intact, were probably laid in the late 1850s. Nearby Olive Street exhibits the use of rough face red granite blocks. Turn of the

century paving trends involved the use of vitrified brick pavers from the well known Canton and Hocking Valley suppliers. A railroad connection to Cleveland in the 1850s provided ready access to the newly developing Berea-Amherst stone district. The Mississippian Berea Sandstone became favorite construction material for early stone structures throughout the city. Later it also became widely used as curbing and sidewalks. The Devonian Columbus Limestone from the Sandusky Bay region also cornered part of the market. By the 1880s railroads radiated out from the city in all directions, making the use of other building stones economically feasible. One of these competitors was the Mississippian Salem Limestone of south central Indiana. Although many of the architectural gems of the downtown have been razed good examples remain.

9:45 EXAMINATION OF THE CONTACT AUREOLE AT MT. SILVERHEELS, COLORADO: CLUES TO CONCEALED MINERALIZATION. **Robert M. Burger and Douglas E. Pride, Ohio State University, Dept. of Geological Sciences, 104 W. 19th Ave., Columbus OH 43210-1110.**

The Silverheels Intrusive Complex (SIC) lies within the Colorado mineral belt, about 16 km southeast of the Climax porphyry molybdenum deposit. The SIC is a Laramide porphyry system consisting of a swarm of sills 6 x 8 km in area centered on a composite quartz monzonite stock. Two igneous phases and a complex series of contact metamorphic reactions are exposed throughout a vertical section of l000m, over an area of 25 km^2, centered on the stock. The igneous rocks intrude arkosic sandstones, siltstones, and limestones of the Pennsylvanian-Permian Maroon Formation, and sulfides occur as disseminations and veins in propylitized rock within roughly one kilometer of the stock. Gold placers related to weathering and erosion of the sulfides have been mined sporadically in the region since 1860. Microprobe analyses of pyrite, chalcopyrite, and pyrrhotite from within the contact aureole identified Au, Ag, Zn, Sn, and W (Mo and Pb were not found). Gold is the most abundant trace metal, averaging 370 ppm for the sulfide phases (for the rock, the maximum is 7 ppm, from along the eastern margin of the central stock). The presence of the composite stock, plus alteration that includes significant sericite as well as the propylitic assemblage (epidote, chlorite, and calcite), suggest that erosion at Mt. Silverheels may have exposed the upper part of a porphyry metal system.

10:00 ORIGIN AND EVOLUTION OF THE EARTH-MOON SYSTEM: CAN THE VARIOUS MODELS BE TESTED BY WAY OF THE ARCHEAN SEDIMENTARY ROCK RECORD? **Robert J. Malcuit and Ronald R. Winters, Denison University, Granville OH 43023.**

Of the four major models for the origin of the earth-moon system (fission, co-formation, tidal-capture, giant impact), only the tidal-capture and giant-impact models are compatible with an initial rotation rate for earth of about 9-13 hours/day. In the giant-impact model, the rotation rate of earth is increased from an initial 10 hr/day to 5.0 hr/day by the giant-impact event. From Ross and Schubert's calculations (1989, *J. Geophys. Res.*, v. 94, p.g 9541, fig. 5a) the lunar body would always be in a circular orbit with eccentricity less than 10%. In this model the lunar orbital radius expands rapidly from an initial 3.0 R_e and by 4.0 bybp (billion years before present), the lunar orbital radius is 45 R_e and the earth's rotation rate is 14.5 hr/day. In contrast, a tidal-capture model (Malcuit, et al., 1992, Proc. Vol., 3rd Int. Archean Symp., p. 223) features capture at about 3.9 bybp into a highly elliptical orbit (major axis =183.0 R_e, ecc.=0.81) with angular momentum equivalent to a circular orbit of 30 R_e (earth rotation rate=10 hr/day). The lunar orbit then undergoes a progressive circularization with energy dissipation via tidal action within both bodies. Throughout the orbital circularization era, an annual sequence of gradually diminishing perigean tidal "spikes" dominates the ocean tidal regime. A two body calculation suggests a time scale of about 1.4 billion years for circularization to 46 R_e (earth rotation rate=14.9 hr/day). In general, the giant-impact and tidal-capture scenarios contrast greatly in the era 3.9-2.5 bybp (the Archean Eon) and are nearly identical from 2.5 bybp to Present. Thus, a detailed study of Archean-age intertidal and subtidal laminites may help to solve the lunar origin problem.

10:15 HYDROGEOLOGY OF AND INITIAL WELLHEAD PROTECTION PLAN FOR DOYLESTOWN, OHIO. **Donald J. Jost and John P. Szabo, University of Akron, Dept. of Geology, Akron OH 44325-4101.**

Information about the geology and hydrogeology of northeastern Wayne County, Ohio can be used to design an initial wellhead protection plan for the Doylestown municipal well field. The wellfield lies to the west of town and is underlain by the Sharon Sandstone. Although this formation provides drinking water for some homes in this area, the major aquifer is the Armstrong Siltstone/Rittman Sandstone of the Mississippian Cuyahoga Formation. A buried valley underlies present-day Chippewa Creek about 4 km to the south of Doylestown. The permeable sand and gravel may be a suitable future groundwater source for the village. Doylestown is located in the Glaciated Central Region (DRASTIC) and consists of two hydrogeolic settings, Glacial Till Over Bedded Sedimentary Rocks (7Aa) and Buried Valley (7D). The average transmissivity of the bedrock aquifers is about 3300 gpd/ft. The measured hydraulic conductivities of the Pennsylvanian sandstones are moderate (10^{-4}-10^{-3} cm/sec) and the conductivities of the Cuyahoga Formation are low to moderate (10^{-6}-10^{-4} cm/sec). Using this data, a comprehensive wellhead protection program can be instituted. By using the calculated fixed radius method various capture zones may be delineated. The DRASTIC mapping system is used to determine the magnitude of potential pollution sources.

10:30 ASSESSING THE HYDROLOGY OF HYDRIC SOILS USING LONG-TERM CLIMATIC RECORDS AND THE WATER MANAGEMENT SIMULATION MODEL DRAINMOD. **L.C. Brown, T.R. Wiley, R.J. Veley, and S.R. Workman, Agricultural Engineering Dept., Ohio State University, Columbus OH 43210-1057.**

Accurate assessment of hydrologic conditions on hydric soils is important for wetlands classifications. DRAINMOD, an agricultural water management computer model developed in North Carolina, contains a validated water balance/hydrology component that can be used to assess wetland hydrology. The project is evaluating the potential use and application of DRAINMOD in assessing hydrology on hydric soils in Ohio. Based on long-term climatic records (10- to 30-year periods of record of hourly precipitation and Max/min temperature) and soils information from the USDA-SCS SOILS5 database, preliminary wetland hydrology assessments have been conducted at nine locations. The wetland hydrology criteria used in the analysis was: water table level at 30-cm or less depth for seven consecutive days during the growing season. The results indicate that the model has potential fur evaluating long-term hydrologic conditions on hydric soils in Ohio, and the influence of certain types of agricultural drainage systems on water table levels. For selected major soil types and locations, probability distributions of the exceedance of wetland hydrology criteria were developed as a function of drainage intensity. Potential limitations noted are accessibility of a sufficient period of record of climatic data, the application of generalized soils information from the SOILS5 database used to represent small-scale field conditions, and miss-interpretation of results if model is used as a black box.

10:45 UNUSUAL DEWATERING OF WETLAND, SUMMIT COUNTY, OHIO. **James R. Bauder, 6106 Armistice Ave., Canton OH 44718.**

This wetland that was typified by emergent, hydrophytic vegetation, has experienced dewatering secondary to a unique series of land use changes. Although none of the earlier land use changes noticeably affected this site: more than 50 years of land use changes have greatly altered this former wetland so that it now contains large areas of upland hydrology. Significant land use changes began with the construction of roads that acted to intercept surface water flows. Later, industrial water well fields were developed immediately adjacent to this site. The last group of land use modifications included the construction of a long dike between the Tuscarawas River and its former flood plain.

Earth and Space Sciences Division Business Meeting
1:30 PM - Saturday, April 23, 1994
Wood
C. Scott Brockman, Presiding

EARTH AND SPACE SCIENCE - GEOGRAPHY
02:00 PM - Saturday, April 23, 1994
Wood
Thomas W. Schmidlin, Presiding

2:00 POLAR GEOGRAPHY IN THE UNIVERSITY CLASSROOM. **Thomas W. Schmidlin, Dept. of Geography, Kent State University, Kent OH 44242.**

Development of a course on polar geography has illustrated some of the difficulties in teaching such a course and the benefits gained by the students. This summary of methods and strategies for teaching the course highlights the important of the polar regions and describes solutions to the difficulties encountered. Justification for a polar geography course includes the large extent of polar regions, their recent 'discovery', multinational aspects, circumpolar nature of land and sea mammals, emerging issues of indigenous peoples, and use of polar regions as indicators of environmental change. Difficulties include overcoming a general ignorance of polar regions, stereotypes of the region, a lack of text books, and prohibitive cost of field trips. Suggestions are made for overcoming these difficulties based on three years of teaching this course at Kent State University.

2:15 THE ARCHBOLD AREA SCHOOLS DEMOGRAPHIC ANALYSIS. **Henry Moon, Dept. of Geography and Planning, University of Toledo, Toledo OH 43606.**

The Archbold (Ohio) Area School District operates in an ever- changing social, political, and economic environment. Both the county (Fulton) and state around it are undergoing substantial shift a and restructuring that necessarily affect the school systems therein. In fact, the only word that seems capable of describing this period in Ohio's educational history is change. This is especially true in terms of school enrollment where adequate planning is critical to the provision of basic educational services. The project described here was the logical beginning of an ongoing effort to better plan for one Ohio community's educational future. This applied geography project took place during academic year 1992-1993 and had two objectives. The first was to document current and near-future district populations for the next five to six years. The second objective was to identify and test key factors that might influence the district's

population. Community volunteers and a group of high school senior volunteers carried out a district-wide demographic survey on Saturday, January 23, 1993. The next step involved the identification, measurement, and testing of a set of potentially influential independent variables that might affect school enrollment. While over 80 independent variables were analyzed, 19 proved significant with r scores greater than .5 or less than -.5. Of these 19 apparently important independent variables, 12 are recommended for further use with seven not recommended because of high standard error. In terms of variable categories, employment type, local construction, and several key population and household categories appeared among the most significant.

2:30 MEASURING THE UTILITY OF POPULATION PROJECTIONS. **David A. Swanson, Arkansas Institute For Economic Advancement, University of Arkansas at Little Rock, 2801 S. University, Little Rock AR 72204-1099.**

State Demographic Centers and other organizations regularly prepare population projections for sub-state areas. In most cases these projections yield results that are within acceptable levels of accuracy. However, they also require a great deal of intellectual and capital resources. This paper explores issues involving the utility of these projections, primarily by examining the ratio of cost to a PRE Measure, which determines the Proportionate Reduction in Error that occurs by using a projection instead of a naive but "no-cost" alternative: holding constant the most recent census results. Empirical results for 1990 county population projections done in the 1980s are reported for counties in Arkansas, Ohio, and Washington, states that experienced different patterns of population change from 1970 to 1990. The results suggest that projections generally have utility. However, more precise cost measures are needed to fully evaluate utility.

2:45 DID ALL THE CHINESE TELL THE TRUTH? TESTING AGE REPORTING IN THE 1990 CENSUS OF POPULATION OF CHINA. **Joseph G. Spinelli, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.**

The author tests the accuracy of age reporting in the 1990 Census of Population of China. Although China is the Third World's largest country, accounting for more than a fifth of the planet's population, and is among the very poorest, its census suggests an unexpectedly high degree of accuracy. Using the Whipple Index to measure the accuracy of China's age statistics, the author shows that China ranks among the very best in the world. This is surprising given the notorious record of most Third World countries. Such accuracy in reporting indicates that the 1990 Chinese census truly reflects the nation's age composition. The question that arises for the population geographer, then, is why is there an unusual imbalance in sex ratios in the world's largest country. The two critical variables in any census, age and sex composition, show China to be suffering from a systematic absence of females, resulting in national sex ratios at or above 100 for all ages. The noticeable imbalance in the childhood ages leads the researcher to suspect that perhaps females are being terminated at birth or are not being reported. Recent accounts of infanticide may be true given the one-child policy of China and the need not to "waste" a pregnancy if the outcome is determined through ultrasound scanning to be a female fetus. The imbalance in sex ratios by age holds true regardless of the scale of the geographic unit surveyed.

3:00 REGIONALISM IN CHINA: A CONTINUING GEOGRAPHICAL ISSUE **Stephen S. Chang, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.**

In discussing China, one cannot overlook the role of regionalism. It was a factor historically and is again a rising issue at present. Throughout Chinese history, when the central government was weak, regionalism grew strong, and it subsided when central control was firm. In China at the present time, regionalism is increasingly evident. This has been brought about by the rapid economic modernization of the past fifteen years. The uneven growth between the coastal and interior provinces has accentuated the problems of economic disparity and rivalry between regions. Moreover, economic gains enable wealthier provinces to be more independent and to resist, disregard, or merely pay lip service to the policies of the Central Government. Another dimension of regionalism is the economic disparity between urban and rural areas. This is especially evident in the fast-developing provinces. Rapidly rising prosperity enjoyed by the urban population is contrasted with the stagnant income and lower standard of living of the rural population. Regional disparities between provinces and urban and rural areas will be an important consideration in the future political, social, and economic development of China.

3:15 Break

3:30 PRODUCER SERVICES IN OHIO. **Bruce W. Smith, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.**

Much of the employment growth in the U.S. in recent years has been in the service industries. One research emphasis has been the location and growth of producer services. Such studies have tended to focus on large metropolitan areas and they have reported that producer services are primarily concentrated in metropolitan areas with only negligible decentralization to nonmetropolitan communities. The purpose of this paper is to examine the geographic patterns of employment change in producer services among Ohio's counties since 1977. While Ohio's central MSA counties still dominate in producer service employment, there has been substantial percentage growth in suburban MSA counties and rural counties.

3:45 GUANO: ITS ROLE AS STIMULUS TO THE MODERN FERTILIZER INDUSTRY. **Thomas D. Anderson, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.**

Because of growing awareness of soil depletion a number of innovative approaches to soil enrichment were tried in the United States and Europe in the early 1800's. Some of these methods had contemporary dimensions in that they employed chemical analyses and recycling principles. Beginning in 1840 the chemical discoveries of Justus von Liebig and the first commercial shipments of guano from Peru to England coincided to stimulate profound changes that led to what has become the modern fertilizer industry. This study examines the sequence of relevant technological advancements and identifies the different resource areas associated with this evolution of economic geography. Acceptance of first guano and then nitrates as necessary materials for commercial agriculture altered world trade patterns and also had geopolitical effects. The geography of sources of phosphates and potash is treated as well. The prospects for continuation of current fertilization methods in light of population increases and greater environmental concerns are reviewed briefly.

4:00 SQUAW AXES TO PIPE AXES: HISTORIC INDIAN TRADE WEAPONRY IN OHIO. **Jeffrey J. Gordon, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.**

American Indians in historic times had a special appreciation for white manufactured goods. In Ohio, as was true for the Eastern Woodlands and Plains regions of the United States and Canada, this fondness was keenly manifested in their desire for metal axes which they viewed as being superior. Although initially used as tools and even jewelry, axes soon evolved in form and function and became used primarily as weapons. Surviving examples from Ohio show that, except for the Missouri War Axe which developed in the West, all the major forms were in use here. Stylistically this includes the French spontoon, classic British, and Great Lakes types. Functionally, with the possible exception of the hammer-poll tomahawk, the entire range was present in Ohio including felling axes, belt axes, spike tomahawks and pipe tomahawks.

4:15 LAND USE CONVERSION IN THE RURAL-URBAN FRINGE AND AVIAN POPULATION AND AVIAN SPECIES RICHNESS. **James D. Hipple, Dept. of Geography, University of Toledo, Toledo OH 43606.**

Land use conversion in the rural-urban fringe is a dynamic and often unregulated process. Conversion of prime habitat areas to suburban or industrial uses in this area detrimentally affects the availability of quality habitat and the availability of food for many species of animals, while enhancing it for others. Land use conversion is analyzed in the rural-urban fringe of western Lucas County to identify the effects of land use change upon native early wintering bird populations. National Audubon Society Christmas bird count data covering a fourteen year period from 1978-1991 are used to determine population trends and species richness for passerine and non-passerine land birds in the 177 square mile study area. Land use conversion is analyzed using aerial photography from 1980 and 1992. Through correlation and regression analysis the effect of land use conversion on the population and richness is analyzed. The rate of change for forest, rural residential, new suburban, suburban with canopy, field, industrial, and open water land uses is correlated with population trends and species richness. Land use conversion affects avian population and avian species richness.

Education Division

JUNIOR ACADEMY
9:00 AM - Saturday, April 23, 1994
Logan
Valerie Kerns, Presiding

9:00 CLONING THE DELTA-ENDOTOXIN GENE OF *BACILLUS THURINGIENSIS*. **Valerie S. Kerns, 2881 Co. Rd. 5N, Bellefontaine OH 43311.**

American agriculture is an industry as old as our country and one of the most productive in the world. One of the key factors to its success is the use Or chemical pesticide. Often large amounts of various pesticides are used to kill harmful insects. These pesticides are often very toxic and harmful to the environment. They must be stored in large amounts of packaging, which will be discarded after the pesticides are applied to the fields. What is needed is an environmentally safe pesticides which is target specific. *Bacillus thuringiensis* is a soil bacterium that produces crystal protein which is deadly to a specific insect group. The purpose of this work is to clone the delta-endotoxin gene into the expression vector pKK 223-3, which results in overproduction of the protein crystal in *E.coli*. This should allow for the increase in production of the toxin while at the same time providing a new packaging system without other *B. thuringiensis* toxins being present.

9:15 GREENHOUSE PLANTS. **Sarah M. Weaver, Rt.5 Box 37, Proctorville OH 45669.**

This experiment was done to show the effect of greenhouse gases on plants. Five plants of each of the species English Ivy (*Hedera helix*), Spider Plants (*Chlorophytum comosum*), and Pothos (*Philodendren oxcarium*) were measured for height, number of leaves, root length and number of root outgrowths and placed in airtight containers holding carbon dioxide (CO_2), methane (CH_4) or normal air. Thirty three days later the containers were opened and the plants

were measured again. The control group showed the most growth and the carbon dioxide group showed the least, but all differences between groups were extremely slight.

9:30 HOUSEHOLD RECYCLING APPLIANCE. **Jeff Smith, 2701 Gradwohl Rd., Toledo OH 43617.**

Recycling is the best solution to today's abundance of garbage. There are products that help people in recycling, but not one single product that separates, crushes, and stores recyclable material. The Household Recycling Appliance is a machine that is located in the base cabinets next to the sink in a residential kitchen. Light emitting diodes and photo transistors are used to separate aluminum cans, polyethylene terephthalate (PETE), and high density polyethylene. An excess liquid collection system collects all liquid remaining in recyclable material.

9:45 RECYCLING LIGHT ENERGY USING PHOTOVOLTAICS. **Venkatesh Satish, 2326 Plum Leaf Lane, Toledo, OH 43614.**

The experiment was conducted to determine how effectively fluorescent light and sunlight energy, in indoor conditions, could be recaptured by photovoltaic cells, comparing amorphous silicon and crystalline silicon cells, if they were placed in 144 different locations on the walls of a classroom. The light intensity and the maximum power generated were measured at 16 points. Linear regression analyses were performed between light intensity and maximum power for both cells under both light conditions for the 16 points. Utilizing the linear regression, the maximum power that could be generated by placing the two cells in the 144 different points was extrapolated. It was determined that, 1.) Measurable amounts of power were generated by both cells under both tight conditions, 2.) Amorphous Cells generated more power than crystalline (33.1 vs 3.0 uW/sq.in.), in fluorescent light conditions. 3.) Under combined sunlight and fluorescent light, crystalline cells generated more power (.456 vs .407 mW/sq.in.). 4.) Power generated by the solar cells was directly proportional to the light intensity measured, so combined light yielded higher power generation (ANOVA $p < .00001$).

10:00 Poster Break

JUNIOR ACADEMY
1:30 PM - Saturday, April 23, 1994
Logan
Valerie Kerns, Presiding

1:30 RAD SCIENCE. **Brian R. Dulin, 207 Reo Dr., Chillicothe OH 45601.**

Radiation can be defined as the transfer of energy by way of particles (alpha, beta, etc.) or electromagnetic waves (visible light, x-rays, gammas, etc.). The shielding of radiation involves the prevention or minimization of this energy transfer. This requires having the proper "shield material" to absorb the energy of the given radiation. The two primary types of radiation that this project dealt with interact with matter in significantly different ways. The beta, a charged particle, interacts via coulombic forces while gammas are attenuated via photon interactions. The varying interaction mechanisms require different materials to properly shield the different radiations. The attenuation of photons, gammas or x-rays, can be described using exponential relationships. The stopping of charged particles, betas, exhibit a range property. The effect that matter has on a gamma flux and to some extent betas passing through it can be represented by the mathematical expression:

Where: $I=I_o e^{-\mu x}$; I_o = Initial intensity of gamma flux; I= Uncollided gamma flux after passing through x thickness of the material; μ = Total linear attenuation coefficient (in cm^{-1}). The tenth-thickness and half-thickness values for the ^{137}Cs gammas can be found and the range for the Sr-90/Y-90 betas can be measured via a series of counts.

1:45 HOW DO POLLUTANTS AFFECT LUMBRICUSES' BEHAVIOR? **Anita P. Tamirisa, 516 Riverside Dr., Rossford OH 43460.**

Lumbricuses play an important role in rejuvenating the soil for plant growth by burrowing and digesting organic material. Acid rain and pesticides pollute the soil and may effect the lumbricuses' behavior. In this experiment commonly used pesticides like Ortho Weed Killer, Ortho Diazion Insecticide spray, Isotox Insect spray, and Fungicide were prepared by running exhaust fumes from a car into distilled water until pH was five. Six terrariums each with four layers of soil were built and five lubricuses placed in each. For fifteen days, each terrarium was treated with one of the agents, and following behavior of lubricuses were observed: Reactions to white light, reaction to touch, weight of castings, extent of burrowing and soil mixing. It was found that controlled lumbricuses treated with distilled water have fastest retractions and reactions and highest weight in castings. Lumbricuses treated with polluted acid water showed most soil mixing and burrowing probably because they were trying to escape acid environment. I think it is important to know the effects of pollution on lumbricuses as they form an integral part of the ecological system that rejuvenates the soil to help plant growth.

2:00 EFFECT OF SUBINHIBATORY CONCENTRATIONS OF QUINOLONES ON THE ADHERENCE OF *PROTEUS MIRABILIS* TO LATEX URINARY CATHETERS. **Scott M. Damrauer, 4332 Candlewood, Sylvania OH 43560.**

Catheter-associated urinary tract infections (UTI) are a major cause of nosocomial infections. Infections caused by *P.mirabilis* are special significance since they are the second, only to *E. coli*, most frequent pathogen implicated in catheter-associated UTI and possess the ability to cause both kidney damage and catheter blockage. A key method of infection is through bacterial adherence to and migration along the catheter surface. This study examines the ability of subinhibatory concentrations of the quinolonges ciprofloxacin, PD 131628, and of Trimethoprim Sulfamethoxazole (TMX)to reduce bacterial adherence. Using a flow through chamber, latex catheter segments were exposed to *Proteus mirabilis* in synthetic urine both with and without the presence of 1/2 x MIC of the antimicrobial agents for 0h, 4h, and 24h. Preliminary results indicate both PD 131628 and ciprofloxacin can reduce bacterial adherence, however, the research is still in progress and the ability of TMX to reduce adherence remains unknown.

2:15 EFFECT OF FREE RADICALS ON PLASMID DNA. **Amy A. Caudy, 5797 Plantation Rd., Sunbury OH 43074.**

Free radicals, commonly produced in biological systems, are molecules with unpaired electrons. Free radicals are known to cause enzyme inactivation, DNA damage, and cell death. Plasmid DNA pBR325, which imparts resistance to ampicillin, was purified and treated with a system of xanthine and xanthine oxidase, a commonly employed source of super oxide anion radical (O_2^-). The treated plasmids were used to transform *E. coli*. The control group of *E. coli* cells was transformed with plasmids exposed only to the enzyme. (Previously, it was confirmed that the enzyme had no effect on the plasmid). Transformation rates dropped sharply in relation to the length of exposure to the xanthine oxidase system. Transformation did not occur with 30 minutes of exposure. Electrophoresis indicates that super oxide exposure causes plasmids either to change to a circular rather than super helical form or to undergo addition of other molecules. The effect of tocopherols (antioxidant compounds related to Vitamin E, and known to terminate free radicals) in the system is under investigation. If super oxide has similar effects in vivo, this supports the concept that free radicals have an adverse effect on DNA function.

2:30 PALEOBOTANY: A LINK TO THE PAST. **Matthew L. Jones, 245 East St., PO Box 293, Ashville OH 43103-0293.**

Paleobotany, the study of fossilized plants, was the basis for my project. I believe that the process of paleobotany research called the "Peel Technique", described by Dr. Taylor, of The Ohio State University, has variances according to the times allowed for each peel to set and the amounts of several substances involved in the procedure. Furthermore, these peels will render identifiable specimens which can clearly be observed under a refractive microscope, I examined the fern-like specimens of the Pennsylvania Era and found structural similarities to fern-like plants today. To explore all of these possibilities, the technique was executed as prescribed. An experimental setup was constructed by establishing the amounts of HCl in the solutions, and a variable being the amounts and location that the acetone was applied. I found through this testing that if the acetone was put both on the coal balls and on the acetate sheets, then the specimen would be in better condition and could thus be better observed. To prove my other assumptions, I proceeded to set up an experiment based on viewing the slides of live plants, and on slides of peels. This showed that they were indeed closely related. Thus, through the experiment, I conclude that the fern-like plants of today and those of the Pennsylvania Era are similar. Also, the variances studied determine the quality of the peel. Finally, I hope that these conclusions can further our gaining information of the subject of paleobotany.

2:45 GAP JUNCTIONAL INTERCELLULAR COMMUNICATION (GJIC) IN NONTRANSFORMED AND TRANSFORMED MOUSE LUNG EPITHELIAL CELLS: EFFECTS TUMOR PROMOTERS AND THEIR MECHANISMS OF ACTION, AND THE INFLUENCE OF CHEMOPREVENTION. **Rakhi Chaudhuri and Randall J. Ruch, Dept. of Pathology. Medical College of Ohio, 3000 Arlington, Toledo OH 43699.**

It is thought that the lack of GJIC may inhibit the transfer of growth regulatory factors. The incidence of GJIC, expressed as a percentage of cells demonstrating GJIC, was determined on mouse lung epithelial cells by fluorescent dye micro injection. GJIC was higher in the non transformed cell (C10: 85-98%) than the transformed cells (82-132: 40-50%, E9: 15-20%, PCC4: 3-10%). Through immunohistochemistry, C10 cells were found to have connexion (CX) 43, but not CX32 or CX26. Butylated hydroxytoluene (BHT, a lung tumor promoter), tetradecanoylphorbolacetate (TPA), and dichlorodiphenytrichloroethane (DDT) reduced GJIC in C10 cells. Phenobarbital (which is not a lung tumor promoter) did not reduce the GJIC. The effects of BHT on the GJIC of C10 cells were examined. Studies with cycloheximide suggest that various metabolites of BHT reduce the GJIC by degradation of CXs. A chemopreventative agent, green tea, was found to prevent the effect of BHT of reducing GJIC of C10 cells.

3:00 PERCEPTIONS OF INTERRACIAL AND INTRARACIAL RAPE. **Jessica H. Hardie, 6780 Stonyrill Ln., Franklin Twp. OH 45005.**

I wanted to know if high school students' perceptions of rape would depend on the race of the victim and/or suspect. I used a survey to test my hypothesis. Each survey had three rape cases on it: marital, date, and stranger. Respondents received one of four versions of the questionnaire in which I varied the race of the victim and suspect as follows: white suspect, black victim; white suspect, white victim; black suspect, white victim; and black suspect, black victim. Each respondent got the same race of the victim and suspect for each case. Then I asked some questions that reflected the respondents' attitudes toward race and gender issues. I then asked questions to determine whether their grade in school, GPA, religiosity, gender, or race affected their decisions. I found that most respondents were much more likely to find the suspect in a stranger rape guilty than a date rape and a marriage rape. Although women are more likely to be liberal in concern to gender related topics, they tend to be just as racist if they are white, as white males are. Similarly, black males, while they are racially liberal, tend to be just as sexist as white males. Therefore, minority status in one dimension apparently does not guarantee empathy towards another's minority situation.

3:15 VERMICOMPOSTING AND ITS EFFECTS ON PLANT GROWTH.

HILLARY THOMPSON, 321 ASBURY RD., CINCINNATI OH 45255.

In this experiment seeds were grown in commercial potting soil and in vermicompost. Their growth and health were compared. The results showed that the plants grew faster, more vigorously, and with a darker green color when grown in vermicompost, obtained by red worms recycling kitchen food scraps in a worm composting system, than in commercial potting soil.

3:30 THE EFFECT OF TETRACYCLINE AND VITAMIN B2 ON THE GROWTH OF *PROCAMBARUS CLARKII*, PHASE II.

MICHAEL A. KANATAS, 2758 KENT RD., COLUMBUS OH 43221.

Antibiotics and various vitamins have been routinely added to grain feed for cattle, hogs, and poultry. The goal of these industries is to accelerate animal growth which in turn yields the farmer a higher profit when selling to market. The basis of this project was to determine if tetracycline and riboflavin could affect the growth of red swamp crayfish, *Procambarus clarkii*. If size increased, it might be advantageous to farm these creatures along with other sea organisms for human consumption or animal feed. Crayfish we separated into two groups (Group A 80mm, and Group B 16mm). Each contained one control group and nine experimental groups. Measured amounts of tetracycline (75mg, 150mg, 250mg, and 500mg) were added two times a week. One half of the tanks also received 25mg of vitamin B2. Group A was dissected after five weeks, and discoloration to various glands was observed. Group B was measured once a week. Weights were obtained on a mettler balance the first week and again on the tenth and final week. There was cut-off point where too much tetracycline was detrimental to growth. Largest growth was found in the tank containing 150mg of the antibiotic. This group also seemed to be the most active and healthiest. Data indicates that crayfish with developing soft shells could be farmed. However, tetracycline and vitamin B2 is changing the organs of these crayfish. How much of the antibiotic lingers in the organs should be taken into consideration since it could be passed off if consumed.

3:45 ALTERATION OF SKIN PIGMENT IN ALBINO MICE.

CATHERINE B. ELL, 10305 CLIFFWOOD RD., PERRYSBURG OH 43551.

The purpose of this project was to determine the possibilities of altering skin pigmentation in albino mice. The artificial method of feeding the mice substances that contain beta carotene would provide coloring in the mice. In albino mice, color is not present due to the absence of melanin. The experiment was controlled with the isolation of the mice in three separate habitats. Each mouse was fed specific quantities of food containing beat carotene; carrots to mouse #1, beets to mouse #2, and normal mouse food to mouse #3; as the control. Each mouse was given a supplemental vitamin to guarantee nutritional balance. The substances were carefully measured to gauge what amount it would take to obtain coloration. After a five month period of time, in which different quantities were tested, there was a slight variance of color in the mice; noticeable in feet and tail. My hypothesis proved correct but non-sustaining; for the coloration could not be maintained. Factors affecting this were the rate of metabolism, the mass of each mouse, and the intake of food on a daily basis. Returning to normal mouse food, the albino mice took on their original appearance within days. In looking for practical application; to assist the albino individual in dealing with the effects of the sun, it does not seem feasible using this method.

4:00 THE EFFECTS OF ENVIRONMENTAL POLLUTION ON MICE.

KIMBERLY J. TESSANNE, 6365 KENSINGTON RD., CARROLLTON OH 44615.

This project includes research collected over two years. The first year used motor oil, diesel fuel, antifreeze and rock salt as land pollution. The second year has not yet been completed. It uses distilled water diluted with sludge as water pollution. The land pollution data collected over a two-month period brought astonishing results. With diesel fuel and oil, the mice experienced heavy breathing bloody eyes and ears, and the death of three young offspring. With antifreeze mange, weight loss and bloody eyes were recorded. With rock salt, the female developed mange and hair loss which eventually led to death. The second year I limited my pollution to one item sludge. This research is still currently in progress but in the past three months no polluted mice have had babies and all show weight loss. I believe the males in both polluted cages have become sterile. More valuable conclusions will be obtained after the end of my research when sacrifice and tissue analysis results are recorded.

4:15 AGGRESSION: THE EFFECTS OF POSITIVE PHYSICAL STIMULATION ON AGGRESSIVE *MUS MUSCULUS*.

ANGELA C POSEY, 4031 THOMPSON ST., CARROLLTON OH 44615.

During the past three years, continuing research has developed verifiable evidence that positive physical stimulation or denial of such can directly alter the behavior of *Mus musculus*. This year genetically produced aggressive subjects were given the positive holding and caressing which had previously reduced aggressiveness in past experiments. Two pairs of aggressive *Mus musculus* were obtained; each set contained one male subject and one female subject. The subject pairs were then placed into separate containment units where they were given ample food and water. Each pair was given positive physical stimulation and observed for any changes in behavior. All significant changes were well documented. The subjects were then allowed to reproduce whereupon the F2 generation was brought into the experiment. The F2 generations of both pairs of subjects were closely monitored, and notations were made to compare the characteristics of this generation to those of the F1 generation. One dominating female and one dominating male, one non-dominating female and one non-dominating male, one dominating male and one non-dominating female, and one dominating female and one non-dominating male were all chosen, each from the opposite F1 generation pair. The F3 generations of all the above listed matches were then observed, and any comparisons and contrasts between the generations were documented completely.

4:30 LONGEVITY INCREASE IN DIABETIC MICE TREATED WITH XENOGENIC ANTI-IgG.

DAWN M. PAULI, 1431 HAYNES ST., BARBERTON OH 44203-7667.

The research was devised because diabetes is caused by an auto-immune response and the question was, could the response be interrupted as evidence by an increased lifespan. The spontaneously diabetic mice have virus encoded in DNA that target the beta cell for islet cell antibodies (ICA) by ten days of age. This attack causes increased mitotic activity of the beta cells peaking at seven weeks. Blood sugar elevation begins at six weeks, so humoral immune response suppression was begun at four weeks. ICA's are IgG antibodies and the mice received 2.5mcg anti-murine IgG subdermally, tapering for five weeks. Controls were given sterile saline. Soon the appearance of the diabetic mice changed. They became obese and polydipsic. The average life-span for db/db mice is five to seven months. The db/db mice receiving anti-IgG died at five, seven, and 10 months. The non-diabetic at twenty three months. Of the mice receiving saline, three db/m died around twenty three months, the db/db died at eight months. Microscopic study revealed destruction of pancreatic islet beta cells in the diabetic mice. My conclusions were that humoral immunity is insignificant in diabetes and a study of anti-lymphocytic serum recpients supports the importance of cell-mediated immunity.

4:30 THE EFFECTS OF BIOLOGICAL CHEMICAL ON *IN VITRO* MUSCLE CONTRACTION OBSERVED SPECTROPHOTOMETERICALLY.

JONATHON A. LEE, P.O. BOX 217, E. LIBERTY OH 43319.

The purpose of this project was to develop an *in vitro* assay of muscle contraction in order to study the effect of biological chemicals on muscle contraction. A rabbit skeletal muscle suspension was prepared by blending 20g of muscle in 200mL of 0.5 KCl. This suspension was spun in a clinical centrifuge at 4000 rpm for five minutes. The supernatant was used for contraction. Contraction was measured spectrophotometerically. This *in vitro* contraction took place in a test tube containing 9ml of ATP and distilled water. A standard curve was developed by use of varying concentrations of ATP. To that was added 1mL of muscle supernatant. These tubes were put into the centrifuge for one minute and tested for the absorbency of light at 600nm. ATP concentrations did influence the absorbency results as well as chemicals such as ATPase and caffeine.

SCIENCE EDUCATION
9:00 AM - Saturday, April 23, 1994
Hardin
David E. Todt, Presiding

9:00 IMPLICATIONS OF THE USE OF TECHNOLOGY IN THE MATHEMATICS CLASSROOM.

ANTONIO R. QUESADA. DEPT. OF MATHEMATICAL SCIENCES, UNIVERSITY OF AKRON, AKRON OH 44325-4002.

The newest generation of graphing calculators and computer algebra systems are transforming the way we teach mathematics. The changes are far reaching, affecting not only the teaching and learning processes, but also the content of our courses and the way we assess our students. Many valid concerns have been raised in which current research is providing some answers. We will look at the implications of bringing technology to the classroom and present the answers we found to some traditional concerns after a three-year experiment on integrating graphing calculators in the teaching of precalculus and calculus.

9:15 METHODS OF TEACHING CHARACTER IN THE SCIENCE CLASSROOM: A REVIEW OF THE LITERATURE FROM 1929 TO 1991.

REBECCA A. STANHOPE, SOUTH FAYETTE TOWNSHIP SCHOOL DISTRICT, 2254 OLD OAKDALE ROAD, MCDONALD, PA 15057 AND KENNETH A. LASOTA, ROBERT MORRIS COLLEGE, DEPT. OF NATURAL SCIENCES, PITTSBURGH PA 15219.

Character comes from the Greek word "charassein" which means to engrave or to give a distinguishing mark and has come to represent the sum of the physical and emotional marks or traits individuals express towards others in terms of their moral behavior. Teaching character or helping individuals develop their moral behavior has been an aspect of American education since the 1640's when the first state sanctioned public schools were formed in the Massachusetts Bay Colony. A review of the "*Education Index: A Cumulative Author Subject Index to a Selected List of Educational Periodicals and Yearbooks*", a publication of the H.W. Wilson Company which complies a yearly list of all published research relevant to the field of education, found that from 1929 to 1991, 1,485 journal articles where published on research aimed at improving methods of teaching character. Of these articles, 29 were devoted solely to improving the methods of teaching character in the primary, secondary or post-secondary science classroom setting. Reviewed here are examples of "direct" or active and "indirect" or passive methods of teaching character in a science class as examined in these 29 articles. Presented are reviews of methods such as "values clarifications" (Raths et al., 1966) and the "social action approach" (Metcalf, 1975) that have been modified for use in a science classroom setting. This information will be useful to any teacher wishing to include character training activities in his/her science classroom.

9:30 NEEDS ASSESSMENT AND CURRICULAR DEVELOPMENTS IN APPLIED MATHEMATICS EDUCATION: A CASE STUDY. Alan D. Smith, Dept. of Quantitative and Natural Sciences, Robert Morris College, 600 Fifth Avenue, Pittsburgh, PA 15219-3099.

World-class undergraduate and graduate education in the mathematical sciences is essential for continuous growth of this nation in scientific progress and economic competitiveness. Unfortunately, due to corporate downsizing, sluggish economy, political changes overseas, increased numbers of graduates in mathematical sciences, and other reasons, unemployment and underemployment rates among new graduates in the mathematical sciences have been increasing while the number and percentage of new Ph.D.'s in this field going into business and industry have been decreasing. This certainly is not the trend that is desired if we are to accomplish the national education goals for our country to reach by the year 2000. The fourth goal, which states that American students will be first in the world in mathematics and science achievement is especially in danger. If we hope to achieve that goal, we must radically change what goes on in our classrooms, both in how we teach and what we teach. The goals of the new B.A. degree in Applied Mathematics with required tracks in Actuarial Science, Applied Mathematics Education, System Science/Computer Applications, and Operations research at Robert Morris College reflect this goal of Mathematical science achievement. The curricular developments and rationale for these tracks will be discussed in detail during the presentation.

9:45 SCIENTIFIC LITERACY CONTENT OF COMMONLY USED HIGH SCHOOL BIOLOGY TEXTBOOKS. Judy Kirsch and Andrew T. Lumpe, University of Toledo, College of Education, Toledo, OH 43606.

Textbooks play a major role in shaping science curriculum and instruction and must be considered in any program to systemically change science education. Several national and state level reform efforts in science education including Project 2061, the National Science Education Standards, and the new Ohio Science Model stress the need for a broadened vision of science education including these scientific literacy strands: 1) the inquiry; 2) a deep understanding of fewer key science concepts; 3) contextual aspects of science; and 4) connections between science, technology, and society (STS). The researcher's purpose was to systematically content analyze the coverage of the four strands of scientific literacy listed above and determine the inquiry level of the lab activities in several commonly used high school biology textbooks. The textbooks were selected based on their popularity and design (traditional vs. nontraditional). Using a coding scheme to analyze the coverage of the four scientific literacy themes in texts, two coders independently coded a random sample of five percent of each selected textbook pages. In addition, all of the lab activities of the textbooks were categorized using a scheme to determine the inquiry level (confirmatory, structured inquiry, guided inquiry, or open inquiry). The Kappa coefficient for intercoder agreement was used and agreement values ranged from .74 to .91. A major focus of all of the textbooks was the presentation of science simply as a body of knowledge with most textbooks covering over 1000 new concepts. The second most common theme in the textbooks was engaging in science inquiry with the nontraditional texts spending larger amounts of time on this theme. Contexts of science and STS themes were rarely dealt with by any of the texts. Most of the lab activities analyzed were either confirmatory or structured inquiry with little opportunity for student input and design.

10:00 Poster Break

SCIENCE EDUCATION
1:30 PM - Saturday, April 23, 1994
Hardin
David E. Todt, Presiding

1:30 SCIENCE IS THE STUDY OF EARTH AND ITS ENVIRONMENT: A RATIONALE FOR INTEGRATING SCIENCE LEARNING. Victor J. Mayer, Professor of Educational Studies, Geological Science and Natural Resources, Ohio State University, 1945 N. High St., Columbus OH 43210.

The Earth systems Education Program headquartered at The Ohio State University started at a conference held in Washington DC early in 1988. Under the influence of the Earth System Science Report authored by a committee representing several federal science agencies with participants at the conference, scientists and teachers drafted ten concepts about the Earth System and recommended them for infusion into K-12 science curricula. A grant from the National Science Foundation supporting the Program for Leadership in Earth Systems Education has resulted in some 50 teacher leadership teams representing most of the 50 states. The program has now shifted its emphasis from the infusion of Earth Systems concepts through the K-12 curriculum, to using the Earth System as a conceptual model for integrating the sciences and other relevant disciplines in the current efforts at restructuring the nation's science curricula. Fundamental to the philosophy of the program are; a framework of seven Earth Systems Education understandings, a focus on student collaboration, authentic modes of assessment, and teacher initiated and developed curricula. Several school systems in Ohio are utilizing the Earth Systems Education model in their restructuring efforts. Resulting curricula seem to reflect closely the emerging state guidelines for science curriculum development as well as the emerging national standards.

1:45 INTEGRATION OF THE TEACHING OF SCIENCE AND AGRICULTURE: PROJECT SYMBIOSIS. Rose Marie Rossetti, Ohio State University, Dept. of Agricultural Education, 204 Ag Admin Building, 2120 Fyffe Rd., Columbus OH 43210-1067.

Twenty-six teachers from across Ohio participated in an innovative training project that enabled science and agriculture teachers to integrate science principles into agricultural curricula and agriculture1 applications into the science curricula. Project Symbiosis, funded by the Kellogg Foundation, was directed by faculty at The Ohio state University, Department of Agricultural Education in 1991-92. Teachers received instruction on the latests scientific advances in agriculture. Agencies and industries involved in the instruction included: O.M. Scott & Sons, Select Sires, Select Embryos, the U.S. Department of Agriculture and The Ohio State University College of Agriculture. This presentation will be focused on the project's design. The teachers were selected by way of an application process. Teachers came to six all day workshops held in central Ohio. Teachers were encouraged to travel to the workshops together to encourage dialogue. Previous to the project, most teachers had not team taught with their partner teacher. The project focused on facilitating interaction and sharing between these science and agriculture teacher teams. Teachers kept monthly logs of their shared activities during the project and submitted them as evidence that teaming had taken place. In addition, periodic random telephone interviews were conducted by the evaluation faculty in order to document the teachers' activities throughout the project. To encourage teacher participation, three hours of graduate credit was granted to each participant. The school districts were reimbursed to hire substitute teachers while the science and agriculture teachers were attending the workshops. In addition, each teacher was allotted funds to purchase curriculum materials or classroom supplies.

2:00 SCIENCE IN THE COMMUNITY - THE WOOSTER HIGH SCHOOL INTEGRATED SCIENCE CURRICULUM. Kevin Hennis and Richard Storck, Wooster High School, 101 W. Bowman St., Wooster OH 44691.

The Wooster High School Science Department has developed a three year integrated science curriculum which promotes skill-based learning. This science curriculum combines the areas of general science, biology, chemistry, earth science, and physics into three one-year integrated courses which emphasize problem solving involving real-life situations. Features of the curriculum include collaborative teaching, cooperative learning, alternative assessment methods, and hands-on learning with emphasis on reinforcing the basic skills of science. The Wooster High School curriculum has many of the features of the state science model and has received Ohio State Department of Education recognition and encouragement.

2:15 PROJECT DISCOVERY: SYSTEMIC MATHEMATICS AND SCIENCE EDUCATION REFORM IN OHIO. David E. Todt and Ann Dinkheller, Project Discovery, Shawnee State University, Portsmouth OH 45662-4303.

The goal of the Ohio Mathematics/Science Project Discovery is to address systemic change by improving the teaching and learning of mathematics and science at the middle/junior high school level through professional development activities for science and mathematics teachers. An important step toward achieving this goal has been the regionalization of efforts to deliver inquiry based mathematics in an in-depth and on-going fashion to practicing teachers. The regionalization has required involvement of a diverse group of stake holders in multi-counties region to cooperate toward the planning and implementation of systemic, sustained reform. The regionalization process has been strongly linked with other reform efforts in an effort to share, coordinate and combine existing resources while also identifying and generating new resources. An element of the regionalization has been exploring new ways of organizing and communicating, including the use of Discovery.Net. This presentation will provide a brief overview of Project Discovery followed by a focus on the regionalization process. The successes and challenges of being part of a statewide program aimed at changing the way we teach mathematics and science will be addressed.

2:30 SCIENCE FAIR SUCCESS IN OHIO. Andrew T. Lumpe & Charlene Czerniak, University of Toledo, College of Education, Toledo OH 43606.

This paper is the compilation of three separate studies on secondary students' participation in a regional science fair in Ohio. The researchers' goals in the first study were to study the relationships among self-concept, parental influences, motivation, and anxiety with science fair achievement assessed using the judges rating of student's projects (N=142). A discriminant analysis function was calculated and it was determined that there was one significant function that predicted rating in the science fair. This function, accounting for 77% of the variance, included five coefficients: the science fair counted as part of the science course grade, the judge's rating on the science fair project determined the course grade, science self-concept, parental pressure, and parental help. In the second study, the researchers' focus was to: 1) ascertain students' perceptions about the advantages and disadvantages for science fair participation; 2) describe students' perceptions about who might approve and disapprove of science fair participation; and 3) determine the relationship of certain internal and external factors to science fair success. Students listed learning, improving ones's grade, and receiving money as advantages and wasted time and hard work as disadvantages of participating in a regional science fair. Parents and teachers were listed by many students as approving of science fair participation. Using multiple regression modeling, only parental education significantly predicted a portion (13%) of the variance in students' actual science fair scores (N=302). In the third study, the researchers desired to examine factors that predict secondary students': 1) attitude toward participating in a district science fair; 2) subjective norm who would approve or disapprove); and 3) perceived behavioral control who controls participating in a science fair). Multiple regression models (N- 455) found that grade level, GPA, being required to complete a science fair project, and anxiety toward the science fair were predictors of the students' attitude toward science fair participation. No tested variable predicted subjective norm. A discriminant function analysis found that grade level, science fair project counting as a course grade, attitude, school type, participation in a gifted course, and participation in a research course were the strongest predictors of perceived behavioral control.

2:45 ATTITUDES OF OHIO TEACHER EDUCATORS CONCERNING SCIENCE FAIRS.

Michael G. Grote, Dept. of Education, Ohio Wesleyan University, Delaware OH 43015.

A questionnaire was sent to all science teacher educators in Ohio with a return rate of 35%. Secondary science certification programs offered an average of 2 hours of instruction on science projects for their preservice teachers, but this varied from 0 to ten hours depending on the university. Elementary certification programs averaged 7 hours of such instruction with a range of from 0 to 45 hours. Teacher educators favored using groups of 3-4 students at early ages. This group preference gradually shifted to individual projects as grade level increased. About 85% of the teacher educators had taught at the pre-college level and about half of those had at least one student participate in a district science day. Teacher educators who participated in a science fair themselves as a student were 50% more likely to have had students who participated in a science fair. There was a high degree of agreement among science teacher educators that science fairs have value in modern school programs, that projects teach scientific methods, that projects give valuable experience in communication skills, that the opportunity to explain research to an outside observer enhances interest, compatibility with constructivist views of learning, and that preservice teachers at all levels should be given some instruction on how to structure independent research projects. Teacher educators were divided about: the effect of large cash prizes on the purposes of science fairs, the value of rating the projects, whether science fairs put too much pressure on students, the quality of the judging at science fairs, value as an evaluation tool for OBE, value without a mentor scientist, and whether the lessons taught by such projects are more effective than good classroom instruction.

3:00 THE INTER-CORRELATION OF STUDENTS' QUIZ SCORES IN A HUMAN LEARNING SEMINAR.

Ralph F. Darr, Jr., Room 301 N, Zook Hall, University of Akron, Akron OH 44325-4208.

Over the past twenty years, the author has developed a three fold system for assessing instructional effectiveness. Correlations were computed between students' scores on the course pretests, unit quizzes, and students end-of-course evaluation of the instructor and instruction. Scores on the unit quizzes were found to be significantly inter-correlated for both the undergraduate educational psychology course and the graduate human learning seminar but not for the graduate psychological foundations course. Last year the author extensively revised the human learning seminar. A new text was introduced, new study questions composed, and new quizzes constructed. This study is designed to assess the inter-correlation of scores on the five, newly constructed 25 item unit quizzes. The graduate seminar which meets sixteen times is organized into five units. After completing each unit, students are administered a 25 item multiple choice quiz over the study questions which are based on the reading material. Coefficients of correlation will be computed between the five unit quizzes to assess the internal consistency of the courses' quiz program. It is essential to establish the inter-reliablity of the unit quizzes before developing a pretest, if the pretest is to be a reliable predictor of student performance in the course. In a course like this seminar where there is a central theme, it is important to determine the degree to which each quiz is reliably assessing that theme.

3:15 INCONGRUENCE BETWEEN GRADUATE ASSISTANT AND FACULTY EXPECTATIONS: SUGGESTED PROCEDURES FOR IMPROVING PROFESSIONAL DEVELOPMENT AND RELATIONSHIPS.

Dianne Brown-Wright and Isadore Newman, University of Akron, 301-C Zook Hall, Akron, OH 44325.

One of the major purposes of graduate education is to develop research skills and become involved in the academic culture. Frequently, the relationship between a graduate assistant and a faculty member is the making or breaking of this very important educational experience which has long term implications.

The purpose of this study was to investigate the level of congruence between graduate student expectations and the expectations of faculty to whom they are assigned. More specifically, the researchers investigated graduate assistant roles and skills expectations, perceived training needs and attitudes regarding authorship. The graduate assistant and faculty survey (GAFS) was administered to graduate assistants and faculty within selected departments at an urban midwestern research institution. An incongruence was found between the expectations of graduate assistants and faculty to whom they were assigned. Suggested strategies and procedures for improving professional development and relationships ensued.

3:30 THE CHEMISTRY OF STRATOSPHERIC OZONE.

R. Thomas Myers, Dept. of Chemistry, Kent State University Kent OH 44242.

The chemistry of stratospheric ozone spans a wide range of chemistry: ultra violet activation and absorption, kinetics of reaction, phase diagrams,etc. This will be reviewed. Attendees will be able to order a complete set of slides, with references, plus background material.

3:45 A MODEL ENVIRONMENTAL SCIENCE MAJOR AND ENVIRONMENTAL STUDIES MINOR.

Simon K. Lawrance, Michael A. Hoggarth and Michael S. Herschler, Dept. of Life & Earth Sciences, Otterbein College, Westerville, OH 43081.

Upon the advice of two environmental science consultants, Otterbein College has devised an Environmental Science major that prepares students for graduate programs or entry level industry positions that require environmental science backgrounds. Additionally, an interdisciplinary Environmental Studies minor is proposed consisting of: 1. An Environmental Studies course, 2. A Science requirements choice of Environmental Chemistry, Biology or Geology 3. A Humanities requirement: choice of Nature & Literature, Environmental Ethics, American Federal Government Issues and Policy, 4. A Social Sciences requirement: choice of Current Economic Issues, Social Problems, Environmental Psychology, and 5. Advanced Environmental Studies, including projects and/or community service. The Environmental Studies course has been given once to great student satisfaction. Supported by grant 91-M-010 of the Ohio EPA Environmental Education Fund.

4:00 EARTH SYSTEMS EDUCATION AS HIGH SCHOOL SCIENCE.

Rosanne W. Fortner, Ohio State University, School of Natural Resources, 2021 Coffey Rd., Columbus OH 43210.

During the 1992-3 and 1993-4 school years, approximately 30 teachers from eleven school districts in central Ohio were brought together monthly by a grant from the Eisenhower program for teacher enhancement in science education. The focus of the project was the Biological and Earth Systems Science (BESS) curriculum being implemented by Worthington high schools as An interdisciplinary, systems-oriented two year course that replaces traditional biology and earth science. Science teachers representing the various districts thus met to learn about curriculum restructure from those who were most familiar with its promise and its perils. As the State was preparing to release its model competency-based science curriculum, the teachers learned about tools that would help them adapt to change: available resources for use in collaborative learning settings, alternative assessments appropriate to such settings, techniques for integrating sciences and facilitating the construction of learning among students. Monthly meetings brought in community experts on environmental topics, activities for applying the environmental information in high school science, and peer teachers eager to share ideas. This paper will focus on the benefits of such an Eisenhower program for preparing teachers for positive curriculum change, and the value of the Earth Systems approach for constructing relevant, integrated science learning.

4:15 GLOBAL CHANGE IN THE GREAT LAKES: A NEW CURRICULUM PACKAGE FOR SECONDARY SCHOOLS.

Rosanne W. Fortner, Ohio Sea Grant Education Program, 059 Ramseyer Hall, 29 W. Woodruff Ave. Columbus OH 43210.

In 1992, Ohio Sea Grant published a set of scenarios for educators and decision makers dealing with how global warming is likely to affect the Great Lakes region. Topics considered included impacts on water resources, biological diversity, forests. agriculture, shipping, recreation, air toxins, eutrophication, fish, and estuaries. All the Scenarios were based on scientific projections and social changes identified by experts, and all are based on the premise that lake levels, unlike sea levels, are likely to drop measurably. Using an Earth Systems approach to integrative and collaborative science, new curriculum materials developed by the Ohio Sea Grant Education Program will assist teachers in dealing with some of the complexities of issues such as global change. Use of existing Sea Grant materials will be discussed in relation to how they can be easily modified to address similar issues.

4:30 INCREASING PUBLIC AWARENESS OF THE ROCKY RIVER ECOSYSTEM.

Sharon B. Hosko, Rocky River Nature Center, 24000 Valley Pkwy., North Olmsted OH 44070.

The Rocky River Nature Center of Cleveland Metro parks has established a volunteer water quality biomonitoring program for the Rocky River ecosystem. The program began in 1991 with 30 volunteers monitoring 8 river sites and has grown to 45 volunteers monitoring 14 sites. Water quality is determined by sampling macroinvertebrates using a modified version of the Ohio's Scenic River Stream Quality Monitoring Program. Sampling is done once a month from April through October. Water quality data is kept on file at the Rocky River Nature Center and is also sent to the Ohio EPA and Cleveland Metro parks Wildlife division. Public involvement in this program has led to a greater appreciation for the life of the river and a greater sense of responsibility to protect and conserve this ecosystem. The nature center has used the volunteer program to develop public slide and video presentations to educate and involve others with the program.

4:45 THE RIVER ECOSYSTEM AS A TEACHING TOOL IN THE LABORATORY OF A LARGE INTRODUCTORY BIOLOGY COURSE.

John W. Miller, Biology Dept. Baldwin Wallace College, Berea OH 44017.

Budget, scheduling and logistical problems are often cited as reasons for not including ecological studies in large introductory college courses. Many elementary and secondary school programs are similarly limited. This is unfortunate because it prevents us from taking advantage of the increased awareness and interest that students have for environmental issues. This report will describe how teachers can overcome some of these problems by "bringing the river to the students" as was done in September and October, 1993 for The Principles of Biology class at Baldwin-Wallace College. The 150 students were in 5 laboratory sections, each of which met for two 2-hour labs per week. River samples were obtained by staff from 5 sites on the Rocky River. The samples were successfully stored in a cold room and utilized in labs over a 2-3 day period. A major objective was to establish a macro invertebrate index of stream quality for each of the sample sites on the Rocky River. This shallow river, on the west side of the Cleveland, Ohio metropolitan area, provides many examples of environmental, socioeconomic and political issues.

Engineering and Technology Division
ENGINEERING: CHEMICAL, ENVIRONMENTAL AND HUMAN
9:45 AM - Saturday, April 23, 1994
Health Education Room 100
James B. Farison, Presiding

9:45 SO_2 REMOVAL THROUGH ION EXCHANGE RESIN 'BUFFERED' AQUEOUS SOLUTIONS. HARI K.V.KRISHNA, SASIDHAR VARANASI, STEVEN E. LEBLANC, DEPT. OF CHEMICAL ENGINEERING, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

This study proposes a novel technique for sulfur dioxide removal from flue gases. The process involves the absorption of SO_2 into an aqueous medium that is 'buffered' with suspended ion exchange resin (IER) particles. This approach leads to superior SO_2 removal compared to the conventional sulfite-based regenerable absorption process. The improved performance is due to the rapid removal of the H+ ions resulting from SO_2 hydrolysis from the aqueous medium via the ion exchange process. This process drives the hydrolysis reaction in the forward direction, thus leading to enhanced SO_2 absorption. In addition, the regeneration of the IER can be accomplished much more easily than the recovery of dissolved reagent in sulfite-based process. The absorption studies were conducted in agitated slurry reactor and packed hollow fiber contactor (PHFC) systems using three types of resins: strong base gel-type, weak base gel-type, and weak base macroporus resin. Gel-type weak base resin exhibited higher SO_2 sorption capacities. Also, the IER-buffered absorbent system proved to be better for SO_2 removal than either pure H_2O or sulfite solution. Dual site sorption mechanism seems to be operative based on the equilibration studies with mono and difunctional acids. Novel packed hollow fiber contactors were tried in place of the standard three-phase slurry reactor arrangement commonly employed in gas-liquid-solid systems due to their attractive operational and design features.

10:00 DESIGN OF A NONLINEAR pH CONTROLLER. SURINDER DESIKAN STEVEN E. LEBLANC, DEPT. OF CHEMICAL ENGINEERING, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

Environmental considerations make the control of the pH of waste effluent streams an important industrial problem. The neutralization of a waste effluent is a nonlinear process. As the neutralization point is reached the pH of the effluent is very sensitive to additions of acid or base. The highly nonlinear nature of the process makes it very difficult to maintain the effluent pH at the desired value (the pH set point). Conventional controllers, such as PI or PID, typically perform very poorly in this type of application. This control problem is overcome by using an online estimation of the titration curve from continuous pH measurements. The estimated titration curve is then used to determine the control criteria from the nonlinear model for the neutralization process. Computer simulations are used to evaluate the performance of the controller, for a hydrochloric acid/acetic acid/ sodium hydroxide system.

10:15 GROUND WATER QUALITY MONITORING IN THE PRESENCE OF SPATIAL AND TEMPORAL VARIANCES. ZEYNEL ARSLANOGLU, DR. MCNICHOLS. UNIVERSITY OF TOLEDO, INDUSTRIAL ENGINEERING DEPT., 2801 W. BANCROFT, TOLEDO OH 43606.

Developing a good statistical test for monitoring the possible ground water contamination from waste facilities requires controlling the facility wide false positive rate and accounting for all types of inherent variability, such as spatial, temporal and sampling, while maintaining a high power to the real contamination. The common practice is comparing individual observations from the down gradient (DG) to the average value of the background (BG), where BG can be formed in different ways. However, this procedure is not valid in the presence of spatial variation. The proposed procedure, use of paired observations between the up gradient (UG) and DG wells, accounts for the spatial and temporal variations. Since more than one parameter is being monitored at several locations, simultaneous statistical procedures need to be used to control the over all risk. The common practice is the use of Bonferroni technique to spread the facility wide false positive rate to over all parameters and wells. This practice tends to be conservative due to the correlation induced by comparing UG-DG differences to the BG. Alternately a generalization (p of m) of multiple comparison with control can be used. The technique is valid when there is no spatial variability and one UG well in the BG. The method is being extended to the case where BG has multiple UG in the presence of spatial and temporal variability.

10:30 NOISE POLLUTION AT CONSTRUCTION SITES. SHAKIR HUSAIN, PH.D., P.E., ASSISTANT PROFESSOR, CIVIL AND ENVIRONMENTAL ENGINEERING DEPT., YOUNGSTOWN STATE UNIVERSITY, YOUNGSTOWN OH 44555 AND EMAD HAJ-TAHIM, B.E. CIVIL ENGINEERING STUDENT, YOUNGSTOWN STATE UNIVERSITY, YOUNGSTOWN OH 44555.

Although construction workers are a small portion of all industrial workers, they account for a large portion of current fatalities and disabilities. One of the reasons for this high incidence of tragedy is a high level of noise that accompanies the construction activities. A basic knowledge of sound, loudness, and sound level measurement provides a background for judging the effects of noise on the work environment. This paper presents the effects of noise on the worker productivity, resulted increased cost of production, and how these factors are incorporated in the design and implementation of a noise-control strategy.

10:45 LOADS ON THE HUMAN JOINTS AND SPINE DURING STATIC AND DYNAMIC PULLING UP AND DOWN TASKS. GH. LUO, D. D. RAFTOPOULOS, DEPT. OF MECHANICAL ENGINEERING, UNIVERSITY OF TOLEDO, TOLEDO OH 43606.

A two dimensional optimization based model was formulated to calculate forces and moments at ankle, knee, hip joints, predict forces of back muscles and at the L3 level disc during dynamic and static pulling up/down tasks. Eight human subjects have been used in this study. Sixteen different tasks were performed for each subject, eight for pulling up and eight for pulling down with weight starting from 2kg, 4kg, 6kg, 8kg. Kinematic data have been obtained by using Motion Analysis System, and the reaction forces and moments have been obtained from an AMTI force plate. Muscular activities during pulling up/down tasks were recorded by using surface electrodes. A linear relationship between the predicted forces and the corresponding EMG values was observed for each muscles at L3 level. The disc compression force showed a linear relationship with erectore spinae muscle group. The forces and moments at ankle, knee, hip and low-back joint increased with the external load increasing from 2kg to 8kg. The results support earlier findings that dynamic pulling up/down activities are more stressful as compared to the static tasks

ENGINEERING: ELECTRICAL, INDUSTRIAL, CIRCUIT DESIGN & MEDICAL APPLICATIONS
1:45 PM - Saturday, April 23, 1994
Health Education Room 100
James B. Farison, Presiding

1:30 ELECTRICAL ENERGY CONVERSION. ANTHONY P. MESSURI, 1786 BASIL AVE., YOUNGSTOWN OH 44514.

Ocean thermal energy conversion systems represent an alternate, although unconventional, energy source. Unlike traditional land-based solar energy systems, which require huge land areas for man-made collectors and storage facilities, a solar sea power plant uses the ocean itself as a natural collector, unlimited in size, without requiring large energy storage facilities. Electrical power produced from the thermal energy stored in tropical oceans would then be transmitted by underwater cable from off-shore platforms to the mainland. The general concept of a solar energy conversion system using ocean thermal differences appears to have the potential to compete economically with other technologies; perhaps just as important are the positive safety aspects and the pollution-free effects on the environment possessed by a solar sea power plant. The basic components of a thermal energy conversion system are discussed. The overall operation of an ocean thermal energy conversion system is investigated and a comparison of different system design efforts is summarized. However, before the economics of a solar sea power plant can be realistically evaluated, consideration must be given to the potential plant site's ocean current velocities, wind patterns, and tropical storm strength, which all may adversely affect the plant's permanent anchoring.

1:45 AN ALGORITHM FOR ECONOMIC GENERATION PLANNING. MONIR AHMAD, PENNSYLVANIA STATE UNIVERSITY AT ERIE, BEHREND COLLEGE, SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY, STATION RD., ERIE PA 16563-1200.

Utility companies plan their generation schedules with load flow analysis. For economic generation planning it is possible to formulate a mathematical cost minimization problem with load flow equations as equality constraints and line loading limits and generator limits as inequality constraints. Such a problem is called an optimal load flow problem. The overall problem involves real as well as reactive powers. Real powers are more sensitive to bus voltage angles and reactive powers are more sensitive to bus voltage magnitudes. The problem can, therefore, be decomposed into two sub problems, one dealing with real powers and the other with reactive powers. This formulations is presented in this paper. Approaches to minimize computational time are discussed and a method for convergence of the sub problem solutions to obtain the solution of overall problem is presented. Successful results on an IEEE power system are presented.

2:00 STRUCTURE OF AGAROSE GELS SUBJECTED TO ELECTRIC FIELDS AS PROBED BY SMALL ANGLE NEUTRON SCATTERING. STEPHEN S. NICHOLS, A. PLOPLIS ANDREWS, S. KRUEGER, AND R. NOSSAL, BOX 2371, COLLEGE OF WOOSTER, WOOSTER OH 44691.

Small angle neutron scattering was used to determine the structure of agarose gels subjected to varying electric fields. The measurements were made using the 30 meter small angle neutron scattering spectrometer at The National Institutes of Standards and Technology in Gaithersburg, MD. Differential scattering cross-sections have been obtained for the Q range

between 0.003 $Å^{-1}$ and 0.02 $Å^{-1}$, corresponding to length scales between 300 Å and 2100 Å, and for electric fields between 0 and 45 volts per centimeter. Subtle changes in isotropic scattered intensity for small angles were evident as the electric fields were varied between alternating and direct current, and as the electric field strengths were varied. The results show no evidence of preferential alignment of the agarose matrix in the direction of the imposed field for these length scales, but the changes in isotropic scattering suggest that alignment may occur for much longer length scales.

2:15 GRINDABILITY OF SILICON CARBIDE-REINFORCED ALUMINUM MATRIX COMPOSITES.

M. J. Peter Wang and Melvin B. Leeb, Jr., Industrial Engineering Dept., University of Toledo, 2801 W. Bancroft, Toledo OH 43606.

Ground samples of silicon carbide particulate-reinforced aluminum matrix composites were investigated to statistically study the surface roughness in relations to three independent factors (SiC content, feed rate, and depth of cut) at two levels each. The grinding was performed by a surface grinder. The average surface roughness values (R_a) were determined by a surface profilometer. The roughness measurements were analyzed by the Analysis of Variance (ANOVA) to assess the effects of the factors upon the surface roughness of the ground samples. The variance ratios (the F-statistic values) for SiC content, feed rate, and depth of cut were calculated as 22.03, 0.97, and 0.25, respectively, for the case in which the roughness was measured in the direction of grinding path (Case I). When the roughness was measured in the transverse direction to the grinding path (Case II), the variance ratios of the three factors became 5.80, 1.71, and 0.17, respectively. It is concluded that the SiC content is the most significant factor determining the grindability of the SiC/Al composites, at 99.5% and 95.0% confidence levels respectively for Cases I and II. To gain an insight into the relation between the surface roughness and the material constituents, the composites were metallographically prepared and then scratched by a Vickers micro hardness indenter to simulate the grinding operation. A scanning electron microscope (SEM) is being used to study the scratched surface to reveal the deformation modes of the hard reinforcements (SiC) and the soft matrix (Al). A material removal model for the grinding of the SiC/Al composites will be proposed.

2:30 TOTAL QUALITY MANAGEMENT AND INFRASTRUCTURE.

Nasir Husain, Senior Civil Engineering Student, JMI University, 508/21 Zakir Nagar, Okhla, New Delhi, 100025, India.

Over the past several years, the term infrastructure has gained much publicity. News stories indicating decaying bridges, roads, and sewers has increased the public interest. There are several factors that are responsible for crumbling infrastructure. First, it is approaching its expected design life. Secondly, the funds available for the regular maintenance are insufficient. Consequently, the structure is allowed to deteriorate to the point at which maintenance is ineffective and reconstruction is usually required. The construction cost of new infrastructure is astronomical. However, the cost of rehabilitation is not small either. Several approaches can be implemented to improve the quality of the infrastructure under the current budget situations. This paper will present the general overview of the current state of our infrastructure. In addition, the concept of total quality management technique and its potential to improve the quality of our infrastructure will be discussed.

2:45 Poster Break

3:15 A CMOS VLSI SUBSYSTEM FOR HIGH SPEED REAL-TIME ALARM CLOCK.

Venkata Ramana Vempati, Vijaya Ramadoss, Edwyn D. Smith, Dept. of Electrical Engineering, University of Toledo, Toledo OH 43606.

High-Speed alarm clocks are required in atomic applications and modern satellites. The design is accomplished using single poly double-metal 2µm CMOS technology with Mentor Graphic's Generator Development Tools (GDT). The alarm clock is a countdown timer with adjustable time divisions The timer is preset to the required time and starts counting down to zero when a clock pulse is applied. A negative edge-triggered D-flipflop with active high and active low clear and preset inputs respectively is the core element which is designed using the Lx Standard Cells. The output delay of this element is 0.2ns. The flipflop is cascaded to form divide by six, decade, divide by sixty and divide by thousand counters that are connected together with the control and preset circuitry which consists of a ring counter and a master reset circuit to complete the design. The delay times for each of these counters was less than 1 ns. For NAND gates it was 0.6ns. The Silicon layout of the design was done using AutoCells. A new router algorithm called multilayer R-Maze router was implemented due to simpler techniques compared to LRoute router. The number of rip and reroute tries for the router was set at 80 to allow the wires to be routed in the given channel width and thus reducing the routing channel overhead. The dense layout is created by connecting adjacent cells by diffusion abutment by proper pitchmatching and placing of power terminals. A 1 MHz dock applied at the input is divided by the series of counters to yield clock pulses that are divided in frequency-domain. At the end of the count a pulse is generated whose width is equal to the countdown period. The rise and fall time delay of this pulse were 1ns and 1.5ns respectively. The final layout connected to the frame was giving optimum performance in terms of speed and propagation delays. The circuit was simulated using Lsim in ADEPT mode which verified the behavioral, logic and structural performance of the circuit.

3:30 CMOS VLSI IMPLEMENTATION OF 64 X 4 ASYNCHRONOUS FIRST-IN FIRST-OUT MEMORY.

Venkata Ramana Vempati, Vijaya Ramadoss, Edwyn D. Smith, Dept. of Electrical Engineering, University of Toledo, Toledo OH 43606.

The FIFO is a serially accessed storage device with independent write-in read-out capability. Data words are stacked within the FIFO in the order in which they are written into the memory. Words are read out of the stack in the same order that they are put in, i.e, the first word written-in is the first word read-out. High-speed FIFO's are designed with TTL circuitry whereas low power devices are designed with CMOS circuitry. The design, layout and simulation of the FIFO is accomplished using a Single Poly Double Metal 2µm CMOS technology with Mentor Graphics's Generator Development Tools (GDT). ARCHITECTURE OF THE FIFO: The FIFO design is carried out in three stages. The first stage involves the design of the basic memory element which is a NOR latch. All the logic gates were designed using Lx Standard Cells. The second stage is extended to a 4 x 4 FIFO both at the schematic and layout levels. At this stage the transistor sizes are adjusted for minimum propagation delay of the circuit estimated to be 0.2ns for the NOR-latch. The silicon layout of the 64 X 4 FIFO is generated using AUTOCELLS in the final stage and the circuit area was estimated to be 1711sq.µm. The simulation is carried out using Lsim in the ADEPT (automatic dynamic electrical partitioning of transistors) mode of the simulator which takes in account the various delays (due to parasitic capacitances etc.) associate with the circuit and the propogation delay of the final layout was found to be 1.1ns. The simulation of the schematic and layout of the 64 x 4 FIFO were done and the final layout was giving expected results at optimum levels in terms of speed. Finally the layout was connected to the frame and it was simulated and verified to work fine.

3:45 ION IMPLANTATION FOR DOPING IN INDIUM PHOSPHIDE.

Ravi K. Nadella, Div. of Engineering and Computer Science, Wilberforce University, Wilberforce OH 45384.

Indium phosphide (InP) is an attractive semiconductor because of its properties like high frequency response, high radiation tolerance, high breakdown voltage. To make electronic devices in InP, doping with impurities has to be done to obtain n-type, p-type, and high-resistance layers. Ion implantation, where impurity atoms are energized and selectively bombarded onto the material, is an attractive doping technique to obtain these layers. Ion implantation of Si, Be, and Fe atoms has been used to obtain these layers, respectively, in InP. Annealing was performed to remove the lattice damage due to ion implantation. Si implanted samples gave high activations and thermally stable electron profiles. In samples implanted with Be, low activations were measured. Be diffused both in and out resulting in unpredictable hole profiles. However, by using P coimplantation, Be diffusion was reduced. Fe also diffused both in and out in Fe implanted samples. But, when the implantation was done at an elevated temperature, low diffusion and high resistivities were obtained.

4:00 FABRICATION OF A P-I-N DIODE IN INDIUM PHOSPHIDE USING ION IMPLANTATION.

Ravi K. Nadella, Wilbur L. Wheeler, and Joy L. Johnson, Div. of Engineering and Computer Science, Wilberforce University, Wilberforce OH 45384.

A p-i-n diode is used as a switching device in high power electronic applications for their high breakdown voltage, low on-state resistance, and low off-state capacitance. A p-i-n diode was fabricated in indium phosphide (InP) to take advantage of InP's superior properties such as low carrier ionization coefficient, high frequency response, high thermal conductivity, high radiation tolerance. Ion implantation was used to fabricate the p-i-n diode as it offers good control over the doping profile. Be/P and Si implantations were performed into semi-insulating (i-type) InP substrate to obtain p-type and n-type regions of the diode, respectively P coimplant was used to reduce the diffusion of Be during annealing. The implanted material was annealed to remove the damage caused during ion implantation. Ohmic contacts were made to the p- and n-type regions by evaporation and subsequent alloying of Au-Zn and Au-Ge alloys, respectively. The diode was characterized for its performance. A forward resistance of 2.4 Ohms (at 100 mA) and a breakdown voltage of -120 V were measured.

4:15 AN INSTRUMENT FOR THREE DIMENSIONAL X-RAY MICROSCOPY.

David A. Reimann, Sean M. Hames, and Michael J. Flynn, Dept. of Radiology, Henry Ford Health System, Detroit MI 48202.

The description of an instrument for three dimensional (3D) x-ray microscopy is presented. Conventional x-ray microscopy is a powerful instrument for evaluating microscopic detail of optically opaque structures, and was quite popular before electron microscopy (EM) became available. While EM has an advantage in two dimensional imaging, the use of x-rays have advantages in penetrating thicker specimens and in the ability to give absolute density measures. Using methods extended from those in clinical x-ray tomography scanners, a 3D array of data is created with resolution (full width half maximum) down to 25 microns in each direction for a 3 mm specimen. We are currently refining this instrument to resolve 5 micron detail in three dimensions for a 1.25 mm specimen. The 3D nature of this data is important for accurate stereologic measures of anisotropic structures and for visualization of complex features found in biologic specimens. The ability to analyze internal structures of wet, intact specimens is an important aspect of this instrument. The current biomedical applications involve the imaging of bone specimens for subsequent stereologic evaluation. Applications outside of biology in include nondestructive testing of industrial parts and materials science, especially of ceramic and plastic materials.

4:30 APPLICATION OF FILTERING TECHNIQUES TO MULTISPECTRAL IMAGE SEQUENCES OF CYTOLOGIC SAMPLES.

Janice L. Bergmooser & James B. Farison, Dept. of Electrical Engineering, University of Toledo, Toledo OH 43606.

Simultaneous diagonalization (SD) filtering is applied to multispectral grey-scale image sequences of stained cytologic (cellular) samples from the human body. The stained samples contain cells which vary in color content. They may also contain small proteins or blood or excess material resulting from the method used to create the sample slide. Image processing is introduced as an aid to the cytotechnologists who examine and diagnose the cytologic samples.

The purpose of applying filtering techniques is to create a single resultant image of a given cytologic sample such that desired features have been enhanced and interfering features have been suppressed. Spatially invariant multispectrel grey-scale image sequences of the samples are formed by holding the relative slide-image sensor position constant while varying the wavelength of the light at which each image is taken. SD filtering is then applied to the image sequences. Results show separation of overlapping cells and suppression of interfering features such as blood and proteins. Several different sample slides and filtering situations are considered in this project.

4:45 COMPRESSION AND RECONSTRUCTION OF RENAL GRAM IMAGE SEQUENCES. **Mark E. Shields & James B. Farison, Dept. of Electrical Engineering, University of Toledo, Toledo OH 43606.**

This paper reports results of the compression and reconstruction of a very noisy image sequence, the renalgram. A renalgram is a nuclear medicine image sequence which studies the chemical processes of the kidney over a fixed period of time to diagnose various kidney disorders. The renalgram is obtained by the temporal variation of a radioactive tracer in the renal system. With no patient motion the renalgram is a spatially-invariant image sequence with all of the features in the image sequence in the same spatial position in each image of the sequence. A technique called simultaneous diagonalization (SD) filtering is applied here to a very noisy 180-image renalgram sequence for compression to a much smaller image set. Due the extremely noisy nature of renalgram image sequences, SD image sequence filtering is combined with traditional methods such as median filtering and spatial averaging and\or weighted and unweighted temporal averaging methods, which are applied to the image sequence prior to application of SD to enhance the reconstruction. The resulting image reconstructions illustrate the potential of this combination of methods.

Environmental Sciences and Resources Management Division

ENVIRONMENT: POLICY AND QUALITY
1:30 PM - Saturday, April 23, 1994
Allen
Ralph E. Ramey, Jr., Presiding

1:30 PRESERVING OHIO'S BIODIVERSITY - A REPORT ON THE FIRST TWO DECADES OF NATURAL AREA AND SCENIC RIVER PRESERVATION. **Ralph E. Ramey, Chief, Ohio Dept. of Natural Resources, 1889 Fountain Square, Columbus OH 43224.**

Since the passage in 1970 of landmark natural areas legislation, the Department of Natural Resources has been working to preserve the biodiversity of Ohio through programs of natural areas, scenic rivers and endangered plant protection. In contrast to other programs of the Department which are either regulatory or very anthroprocentric aimed at maximizing opportunities for various outdoor recreational activities, the programs of the Division of Natural Areas & Preserves are almost exclusively biocentric aimed at saving forever the best remaining examples of Ohio's natural heritage. Through acquisition and dedication, over 20,000 acres of prairies, forests, wetlands and river corridors have been given permanent protection. From small sites protecting a single "listed" species, to large bioreserves that protect a fine example of a community, the system includes 105 sites in nearly two thirds of Ohio counties. Many high quality areas have been preserved, but good examples of other natural communities and habitat for endangered plants and animals remain yet unprotected.

1:45 TRANSPORTATION OF HAZARDOUS WASTE: AN ASSESSMENT OF OHIO REGULATORY PROFESSIONALS ATTITUDES TOWARD RISK AND IMPLICATIONS FOR PUBLIC POLICY. **John M. Scherberl, Ohio Environmental Protection Agency, Division of Hazardous Waste, P.O. Box 1049, 1800 WaterMark Dr., Columbus OH 43266-0149.**

Ohio utilizes dual authorization to implement its hazardous waste transportation regulatory program. The Ohio Environmental Protection Agency (Ohio EPA) and the Public Utilities Commission of Ohio (PUCO) each have unique roles in this program, with no formal agreement between the two for regulatory coordination. Ohio EPA primarily regulates the operations facilities of transporters, while PUCO focuses on regulating transport vehicles on the highways. The purpose of this study was to identify and numerically rank hazardous waste transportation risk factors, to measure whether attitudes toward these and other environmental risk factors differ among regulatory personnel from Ohio EPA and PUCO, to assess the degree of coordination in regulating hazardous waste transportation that exists between the two organizations, and to assess any potential impact that differences in attitudes or in lack of communication might have on the effectiveness of Ohio's hazardous waste transportation regulatory program. A questionnaire was used to measure individual attitudes toward transportation risk factors and toward the overall risk posed by transportation of hazardous wastes compared to other environmental issues, to determine the level of coordination between Ohio EPA and PUCO, and to assess how these issues might affect public policy in Ohio.

2:00 Poster Break

2:45 SPATIAL AND TEMPORAL PATTERNS OF PHOTOSYNTHESIS IN SANDUSKY BAY AND LAKE ERIE. **Robert T. Heath, Rochelle Sturtevant, Ping Jiang and Soon-Jin Hwang, Water Resources Research Inst. and Dept. Biol. Sci., Kent State University, Kent OH 44242-0001.**

Spatial and temporal patterns of epilimnetic photosynthesis were examined along a trophic axis extending from the upper basin of Sandusky Bay (SB) to the central basin of Lake Erie (LE) during 1993. Uptake of ^{14}C-bicarbonate was measured in a photosynthetron to determine photosynthesis vs. irradiance. Photosynthetic parameters were determined using the equations of Talling (1957) and Platt (1980): photosynthetic efficiency (α), photosynthetic capacity (P_{opt}) and photo inhibition (β). *Oscillatoria* (Cyanophyceae) dominated at SB sites; diatoms dominated at LE sites. Plankton from the central basin of Lake Erie consistently exhibited surface photoinhibition, an effect not observed at the Sandusky Bay sites. In May, total areal carbon flux through the photosynthetic pathway in Sandusky Bay was approximately an order of magnitude higher than carbon flux through this pathway in Lake Erie. This difference between the Sandusky Bay and Lake Erie sites diminished during the growing season, especially in the Sandusky sub-basin of the central basin of Lake Erie. This study was supported by Ohio Sea Grant R/ES-5.

3:00 LITTER MACROINVERTEBRATE DIVERSITY IN THE MANAGED FOREST LANDSCAPE OF WESTERN MARYLAND. **Ronald R. Bailey and Brian C. McCarthy, Dept. of Environmental and Plant Biology, Ohio University, Athens OH 45701.**

As a result of standard forest management practice, much of the hardwood forest landscape of the central Appalachians represents a mosaic of even-aged patches in different stages of successional development. Pitfall trapping was used to determine the effects of forest development stage on litter macroinvertebrate diversity. Twelve stands, in four development stages (clearcut, pole, mature, and over mature), were studied in the Savage River State Forest, Garrett Co , MD. In each stand, pitfall traps were placed in two previously established 25 x 50 m permanent plots. Sampling was done in two micro sites—under a log and on the open forest floor. Samples were collected in May, June, July, and August of 1992 and all specimens were identified to the lowest possible operational taxonomic unit (OTU). Brillouin's diversity index (HB) were used to assess patterns of invertebrate diversity. Stand development stage was found to have a highly significant effect on diversity (ANOVA p , 0.0001). Clearcuts had the greatest average diversity (HB = 4.07) relative to pole (HB = 3.80), mature (Ha = 3.36), and over mature (HB = 3.59) stands. However, each development stage had its own set of unique fauna, suggesting that all of the stages are important in the forested landscape. The effect of microsite was strong but not significant (ANOVA, $p < 0.0648$). This trend might be intensified through alternative forest management practices that increase structural heterogeneity in the forested landscape.

3:15 SUCCESSION OF ARTHROPODS ON CARRION IN OHIO. **Carla M. Price, Dept. of Biology, Denison University, Granville OH 43023.**

Forensic entomology is a field which has made frequent contributions to recent criminal investigations by helping determine post mortem interval, or time since death. The species of insects found on a corpse and their succession patterns are heavily dependent on geographic location and microclimate. A thorough literature search revealed no previous analyses of carrion fauna in Ohio. The goal of this project was to document the time dependent succession of insects on carrion exposed to different seasons and habitats at Denison University's Biological Reserve in Granville to provide essential base line data to which evidence collected from Ohio crime victims can be compared. Stillborn pigs (*Sus scrofa*) were obtained from a local farmer within twenty-four hours after death and placed in two-foot square wooden cages that were covered with hardware cloth to prevent interference by non insect species. One pig was photographed at various decay stages, but remained undisturbed otherwise. Variables such as carcass condition, decay stage, weight, body temperature, pig/soil interface temperature, ambient temperature, rainfall, and frequency and species of insects present were recorded twice daily from the other pig. Insects were collected, preserved, and identified. Over 23 species primarily representing Silphidae, Staphylinidae, Dermestidae, Calliphoridae, and Sarcophagidae were collected through the autumn. Additionally, large aggregations of *Alydus* (sp.) were observed feeding on the pigs.

3:30 THE BURROWING MAYFLY *HEXAGENIA* AS AN INDICATOR OF THE RECOVERY OF WESTERN LAKE ERIE. **Kenneth A. Krieger and Susan Hedy, Water Quality Laboratory, Heidelbery College, Tiffin OH 44883.**

Hexagenia nymphs were characteristic of the soft bottom sediments of the shallower regions of Lake Erie until the mid-1950s. In the western basin they attained local densities >1,000/m^2, averaging near 400/m^2. Nutrient loading and subsequent increased oxygen demand created occasional summer anoxic conditions near the bottom which extirpated the nymphs from the lake. Nymphs were not reported from the lake from 1965 until 1992. *Hexagenia* adults began to appear in noticeable numbers in 1992 along the shoreline of the western basin. In 1993 we surveyed nine sites in the eastern half of the western basin, where the nymphs were last seen prior to the 1990s, to determine the distribution and density of nymphs in the sediments. Triplicate grab samples were collected at each site in June, July, and September. Adult emergence was monitored qualitatively. Nymphs were sparse at four sites near South Bass Island and were not found at the other five sites. Calm weather permitted oxygen depletion to

near 2 mg/L, perhaps lower, in the bottom waters. Nymphs were not recovered in the September samples, which suggests that they may have succumbed to low oxygen conditions. Adults emerged primarily in late June and early July, but a few continued to emerge until late August. Our results indicate that conditions at the bottom of the western basin are marginally suitable for *Hexagenia* and that the success of its recolonization remains tenuous. Its reappearance in the lake indicates gradual improvement in oxygen conditions and perhaps a decline in sediment toxicity.

3:45 PATTERNS AND CAUSES OF DENSITY FLUCTUATIONS IN THE WHITEFOOTED MOUSE, A TWENTY YEAR STUDY. Ruth H. Lewellen and Stephen H. Vessey, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403.

We studied annual patterns in *Peromyscus leucopus* densities in a two-hectare wood lot in Northwestern Ohio. *P. leucopus* had been live-trapped from 1973 to 1992, and showed a seasonal pattern of population density, peaking from July to August and declining to a low between December and March. Population peaks varied from 27 to 181 individuals, and troughs varied from 4 to 46 individuals. This variability in density was studied using univariate Box-Jenkins time series models. Based on preliminary analyses, current densities were correlated with previous densities with lags of one and twelve months, explaining 81% of the variability in density. In addition, the effect of regional weather on *P. leucopus* densities was studied using multivariate time series analysis. A principal component analysis was run on 13 weather variables, yielding three principal components that were interpreted as temperature, precipitation, and extremes. The extremes component included temperatures above 32°C and below -18°C, and snowfall. Based on preliminary analyses, the extremes component had a negative effect on density with a two month lag. The temperature and precipitation components both had a positive effect on density contemporaneously and with a one month lag. It is not yet clear how much of the variability in density is explained by weather. Future studies will attempt to incorporate past densities and regional weather into one model predicting future *P. leucopus* densities.

4:00 STATUS OF THE FEDERALLY ENDANGERED ALABAMA CAVE SHRIMP, *PALAEMONIAS ALABAMAE* SMALLEY (DECAPODA: CARIDEA: ATYIDAE). H. H. Hobbs III, Dept. of Biology, Wittenberg University, PO Box 720, Springfield OH 45501-0720.

The troglobitic Alabama Cave Shrimp, *Palaemonias alabamae* and the only other member of the genus, *Palaemonias ganteri* Hay (Kentucky Cave Shrimp), are listed as Federally Endangered Species due to small populations in a limited number of localities. Historically, *P. alabamae* was known only from two localities in Madison County, Alabama but has not been observed in the type locality since November 1973. Loss of the guano food base in this cave because of the disappearance of the Grey Bat, *Myotis grisescens* Howell, and/or water contamination by pesticides may be the explanation for the apparent extirpation of shrimp from this site. Field work initiated by the U. S. Fish and Wildlife Service resulted in the discovery of additional populations in three Madison County hydrologically connected caves in October and November 1991 by members of the Geological Survey of Alabama. It is recommended that water quality monitoring resume and that additional tracer-dye studies be conducted in order to define more precisely the recharge areas for the sites. Known populations are being monitored and search for additional localities continues.

4:15 HUMAN DISTURBANCE AND NESTING SUCCESS IN GREAT BLUE HERONRIES OF NORTHEAST OHIO. Becky A. Carlson and E. Bruce McLean, Dept. of Biology, John Carroll University, University Heights OH 44118.

Nineteen Great Blue Heronries (*Ardea herodias*) were studied in Northeastern Ohio and vicinity during the 1993 nesting season. 1,270 nests were surveyed for number of young fledged as a measure of breeding success. Also noted were: distance from perimeter nests to human foot traffic, the type of barrier surrounding each heronry (water, land, land and water, fence, none), and types of disturbances that occur near each heronry (foot traffic, mechanical, none). No relationship was found between nesting success in Great Blue Herons and distance alone, but a strong correlation was discovered between the number of young fledged and barrier type. Effectiveness of the barrier in isolating nesting herons is not solely a function of distance, but rather the barrier's ability to actually prevent intrusion. There is also evidence that mechanical disturbances in the vicinity of a heronry do not negatively affect nesting success.

4:30 IMPACTS OF SPECTACLED FLYING FOX GUANO AND LEAF STRIPPING ON SOIL FERTILITY AND RAIN FOREST VEGETATION AT ROOST SITES. Christine A. McKenzie, Dept. of Biology, John Carroll University, University Heights OH 44118.

Two research sites were studied from 6 Nov 1993- 2 Dec 1993 on the Atherton Tableland, N. Queensland, Australia to determine the impact of spectacled flying foxes, *Pteropus conspicillatus*, on soil and developing rain forest vegetation beneath individual colonies. Vegetation surveys were conducted at each site, beneath flying fox colonies and in uncolonized areas. Soil samples were taken from each quadrat, pH tested and used in sorghum growth experiments. On average, a greater number of seedlings <10 cm high was growing beneath colonies than under unoccupied areas. Soil samples taken from colonized areas were shown to have a significantly low pH which has no significant effect on sorghum germination and growth in a controlled setting. Increased seedling germination beneath roost sites and sorghum growth experiments show that flying fox colonies do not appear to negatively impact seedling germination but factors determining seedling mortality in rain forest habitat have yet to be determined.

ENVIRONMENT: WASTE MANAGEMENTAND REMEDIATION
1:30 PM - Saturday, April 23, 1994
Erie
Howard H. Lo, Presiding

1:30 TANNERY WASTEWATER TREATMENT USING ACTIVATED SLUDGE. Iswahyuni and Yung-Tse Hung, Civil Engineering Dept, Howard H. Lo, Dept. of Geological Sciences, Hao-Che Howard Pu, Computer and Information Science Dept., Cleveland State University, Cleveland OH 44115.

The growing of leather goods has a great deal of impact in our environment. There are many different processes that consist of several steps in the processing leather (tannery) and each of the step will produce waste water. In general, the characteristic of tannery waste water is high BOD, high solids, high suspended solids, soluble materials, color and odor. Tannery waste is mainly water borne. The solid waste can be reduced by converting it to fertilizer or other products. However, the effluent may endanger ecosystem, if it is directly released in open water since it contains toxic materials. To reduce deterioration of surface water quality due to tannery waste water, some treatment of tannery waste water is urgently needed. This paper will describe the characteristic of tannery waste in each step and the possible treatment by using activated sludge process.

1:45 BIOLOGICAL TREATABILITY OF DAIRY WASTEWATERS. Peer M. Joy and Yung-Tse Hung, Civil Engineering Dept, Hao-Che Howard Pu, Computer and Information Science Dept, Cleveland State University, Cleveland OH 44115.

Biological treatability of an integrated dairy plant wastewater containing a small fraction of whey-washwater mixture has been experimentally investigated. Emphasis has been placed on the assessment of the initially inert fraction, and soluble residual microbial products. Parallel batch experiments were conducted to determine the kinetic and stoichiometric coefficients of the degradable COD. The results have shown that the waste water tested had practically no initially inert fraction, but generated residual microbial products amounting to 6-7% of the initial degradable COD. The results obtained were fed into a set of equations describing the steady state operation of an activated sludge system wit sludge recycle and a relationship indicating the variations of the total effluent COD with the sludge age was defined for the waste water tested. It is noted that effluent COD cannot be biologically reduced below 85 mg/l regardless of the sludge age, due to generation of residual fractions.

2:00 BIOLOGICAL TREATMENT OF COKE-PLANT WASTEWATER FOR COD AND NH_3-N REMOVAL. Nagaraju Sreeramulu and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

For removing COD and NH_3-N from high-strength coke-plant wastewater, studies were conducted in a lab scale, continuous flow system, in which anaerobic, anoxic and oxic units were included. The results have shown that the effluent COD and NH_3-N of A-A/O system could be less than 78 mg/l and 4.7 mg/l, respectively, when the influent COD and NH_3-N were higher than 1200 mg/l and 240 mg/l, respectively, at a total hydraulic detention time of 36 hrs. Moreover, the total nitrogen of waste water was removed by 49%. It is concluded that A-A/O system is efficient for coke-plant wastewater treatment and the anaerobic process has played very important role in the system.

2:15 EFFECTS OF SUGAR ADDITION ON YEAST TREATMENT OF POTATO WASTEWATER. Howard H. Lo, Dept. of Geological Sciences and Yung-Tse Hung, Dept. of Civil Engineering, Cleveland State University, Cleveland OH 44115.

The objective of this study was to determine the effect of sugar addition on the treatment performance of potato wastewater by yeasts. Parameters used for the investigation included types of yeast, dosage of yeast, pH level, sugar dosage, and potato wastewater strength. Types of yeast included beer and baker yeast. The pH levels consisted of 4, 6, and 8. Feed strength levels of wastewater were 500, 1250, and 2000 mg/l of TOC (total organic carbon). Twelve bench-scale batch reactors were used in this study. Three reactors were control reactors without sugar addition. TOC, TSS (total suspended solids), VSS (volatile suspended solids), and pH were determined during the batch reactor experiments. Results indicated that a better TOC removal efficiency was obtained using the beer yeast and at a pH value of 4.0. Increase in dosage of sugar addition to the potato waste water improved TOC removal efficiency. The TOC removal efficiency varied from about 60% to 82% for batch reactor treatment of potato wastewater with yeasts.

2:30 MIXING EFFECT ON ANAEROBIC TREATMENT OF POTATO WASTEWATERS. Suresh R. Karri and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

Anaerobic treatment of high-strength industrial waste waters is a proven alternative to aerobic treatment. It offers substantial waste stabilization with an added benefit of utilization of biogas as a source of energy. A lot of research work has been directed at the development of

variations in process and reactor design of anaerobic treatment facilities. Examples include anaerobic contact reactors, fluidized beds, upflow anaerobic sludge blanket (UASB) reactors, baffled tanks, and several other reactor configurations. However, the role of mixing plays in each design variation has not been clearly established. Four laboratory-scale reactors were used to study the effects of mixing intensity and mixing duration on the anaerobic treatment of potato-processing wastewater at 200 C. It was found that both mixing intensities and mixing durations studied and their joint effect significantly affected the steady-state performance of the anaerobic reactors in treating the potato-processing wastewater with respect to organics and solids removals and methane production.

2:45 ANAEROBIC TREATMENT OF POTATO PROCESSING WASTEWATER.

Suresh R. Karri and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

Potato processing wastewater is characteristically of high organic strength (BOD from 3,000 to 10,000 mg/L and SS from 1,500 to 5,000 mg/L), and has high levels of TKN (70 to 350 mg/L). The wastewater's organic strength makes it attractive to treat anaerobically; consequently, there are several existing full-scale anaerobic pretreatment systems for potato-processing wastewater. The metabolic product methane may be useful as a fuel source for conditions which favor the growth of the acid forming-methanogenic symbiotic organisms. No molecular oxygen needs to be provided, the quantity of cells produced is much less, with nutrient requirements reduced accordingly and may not need to be added. Loading rates can be high which permits processing of wastes having high organics providing toxicity is not limiting; the much slower growth rate from lower kinetic values requires larger holding equipment; and cell retention times must be longer, days instead of hours. This paper discusses different types of anaerobic treatment systems which encompass both high and low rate reactors and also discusses several case studies.

3:00 ANAEROBIC TREATMENT OF POTATO WASTEWATERS.

Ramesh V. Yalamanchi and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

The use of anaerobic treatment as pretreatment before the aerobic treatment of the potato processing wastewater has become a common practice. The anaerobic treatment processes such as UASB effectively removed 85% of the total COD and 90% of the soluble COD present in the wastewater and reduces the stress on the aerobic treatment process. Although anaerobic pretreatment removes 85% t 95% of the raw wastewater COD and SS, nearly all of the nitrogen present in the raw wastewater remains in the anaerobic effluent and the conventional aerobic polishing of the aerobic effluent (either activated sludge or aeration basins) removes little of the nitrogen. Due to the relatively high nitrogen concentrations involved there may be negative impacts on the environment if these treated waste streams are released directly. Nitrogen can be biologically removed from wastewater in properly designed and operated systems such as A/O activated sludge, UCT, ICEAS, oxidation ditches, fixed film reactors and The SBR. Among the above processes SBR processes is widely chosen, because of the single basin reaction clarification capability of the SBR.

3:15 PNEUMATIC FRACTURING EXTRACTION OF VOLATILE ORGANIC COMPOUNDS.

Ramesh V. Yalamanchi and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

Pneumatic fracturing extraction is a process used to remove volatile organic compounds from the vadose zone, particularly where the ground formation is relatively impermeable to the airflow. This process involves injecting short bursts (<1 min) of compressed air (up to 500 psig) into the formation, causing the formation to fracture at weak points. This fracture will allow increased flow of air through the formation and in effect increases the permeability of the formation and the radius of influence for vapor extraction. The results suggest that PFE can make low permeable formations such as the bed rocks, shales and clay suitable for vapor extraction. It was found that PFE does increase extracted airflow rates by more than 600% and trichloroethene (TCE) mass removal rates by 675% and in one experiment methylene chloride (CH_2CL_2) concentration was peaked at 8677 ppm after postfracture mass removal when the peak concentration for prefracture was 25 ppm. The radius of influence of vapor extraction also was greatly enlarged by fracturing and thus reduced the number of monitoring wells required for vapor extraction.

3:30 EVALUATING PETROLEUM DEGRADING POTENTIAL OF MICROORGANISMS FROM WATER AND SEDIMENT.

Majid Zarrinafsar and Yung-Tse Hung, Civil Engineering Dept, Cleveland State university, Cleveland OH 44115, Ruth Yu-Li Yeh and Jack Kuei-Chung Shi, Ming Hsin Engineering College, Hsinchu, Taiwan.

Anaerobic microbial reactions in the marine water and sediment is a potential way of degrading the complex organic pollutants. Petroleum products are a major component of these organic pollutants. This paper examines the ability of the microorganism in the sediments and the water to degrade the petroleum products. Portions of solution supplemented with nitrate and phosphate was inoculated with river water and dilutions of the river sediment. The inoculated solutions were overlaid with sterile solid pollutant from the river. The solid pollutant was a chloroform extract from the river bed. Duplicate cultures and uninoculated controls were incubated for 28 days at 20 °C to 22 °C. Microbial growth and release of acidic products were monitored in weekly intervals. Extracts were fractionated over ion exchange columns with alumina as stationary phase, to aromatic, resin, and asphaltene components. The percent and the component type of the petroleum product degraded over time were determined and graphed.

3:45 BIOLOGICAL TREATABILITY OF PHENOL AND METHANOL.

Ravindra R. Wani and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

This paper describes the effects of temperature, pH, salinity, and nutrients on biological treatment of phenol and methanol with a statistical analysis. The substrate utilization rate coefficient (k) decreased as pH deviated from neutral and as salinity increased, and the unfavorable pH and salinity alleviated the temperature effect on k. The endogenous respiration activity was affected by various environmental factors such as pH, temperature, and salinity; however, the cell decay coefficient (kd) turned out to be correlated to a single parameter, k. In batch treatment of 770 mg/l phenol and 1000 mg/l methanol as TOC, nitrogen and phosphorus did not have any recognizable effect on k, while trace elements, Fe, Mg, Mn, Ca, and Zn, showed a slightly perceptible effect. The absence of extra-cellular nitrogen and phosphorus resulted in a greater cell yield; however, the cells in this condition decayed more rapidly than normal cell. The primary factor affecting the substrate decomposition rate in natural systems was pH. An initial lag phase was observed in 8 out of 115 phenol batch tests and 31 out of 66 methanol batch tests.

4:00 FACTORS AFFECTING BIODEGRADATION OF PHENOL IN SAND AND CLAY.

Ganesh Balakrishna and Yung-Tse Hung, Civil Engineering Dept, Cleveland State University, Cleveland OH 44115.

The main objective of this work is to study the effect of various factors in the biodegradation of phenol in soils. Three types of samples used include pure sand, pure clay, and combination of the two in equal proportions. The factors investigated consist of soil to water ratio, the strength of the contaminant and the dosages and the types of LLMO (live liquid microorganisms) used in bioaugmentation. Five types of LLMO were used in this study. Nitrogen and phosphorus were added as nutrients. Samples were agitated in a shaker for a duration of 24 hours and the initial and final TOC (total organic carbon) were determined. Performance of the various combinations of the various parameters in degrading the phenol contaminant were studied and compared.

4:15 REMOVAL OF ORGANIC POLLUTANTS BY PACT.

Jae-Choun You and Yung-Tse Hung, Civil Engineering Dept., Howard H. Lo, Dept. of Geological Sciences, Hao-Che Howard Pu, Computer and Information Science Dept., Cleveland State University, Cleveland OH 44115.

Activated sludge process is widely used for treating industrial organic wastewater. Adequate management in operating the biotreatment system is necessary to maintain the desired performance efficiency. With the growth of industry and increased use of various chemicals in households, there is an increasing number of compounds that fail to respond to this treatment process. Since activated carbon is able to adsorb many organic compounds, activated carbon has been used to treat wastewater of biological treatment plants. The purpose of this study is to elucidate the effect of powdered activated carbon (PAC) additions on performance of activated sludge (AS) process and factors affecting the efficiency of PACT, such as carbon concentration, sludge age, hydraulic detention time, two stage PACT, and temperature in treating wastewater. Further improvement in performance of biological treatment was studied using powdered activated carbon in the activated sludge process. The results indicate that it improves the process, probably by reducing the inhibitory action of the compounds.

4:30 OPTIMIZATION OF ACTIVATED SLUDGE SYSTEM BY BIOAUGMENTATION.

Pradeep Menon and Yung-Tse Hung, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115.

The activated sludge system is increasingly being used for the treatment of chemical process plant effluents. However, in many real plant situations, effluent treatment plants are subjected to a number of unfavorable operating conditions like high sludge production, shock loading, and poor settling characteristics. In these conditions, traditional optimizing techniques are sometimes poor solutions to maintain high treatment efficiency. This paper describes the use of the bioaugmentation technique as a method to flexibly optimize an activated sludge system used for the treatment of wastewater containing high concentrations of organic chemicals. The augmented system is evaluated for the removal of BOD, COD, settling characteristics and also for the degradability of hazardous chemicals. The situations examined include transient loading of the system, varying organics concentration in the in fluent and varying parameters like pH and nutrients. Different methods for the application of bioaugmentation are studied and their effect on the treatment efficiency for the activated sludge system were examined.

4:45 MERCURY REMOVAL FROM MERCURY BEARING WASTEWATER.

Rohinton B. Mehta and Yung-Tse Hung, Civil Engineering Dept., Cleveland State University, Cleveland OH 44115.

Mercury pollution has always been a major environmental issue due to its toxicity and its ability to concentrate in aquatic life. This paper describes various methods for the treatment of mercury bearing wastewater. Liquid ion exchange method for mercury removal from water over a wide pH range has been described as have been other conventional method of mercury removal. $HgCl_2$ can be removed from wastewater by ion exchange using chelate resin. A method for recovery of the mercury from the chelate resins by electrolytic desorption is briefly described. Newer techniques like the extraction of mercury with sulphurized jojobba oil and the use of modified Hardwickia binata bark for adsorption of mercury from water are also described.

Information, Computing and Communications Division COMPUTER SCIENCE: SYSTEMS, ARTIFICIAL INTELLIGENCE & MEDICAL APPLICATIONS IMAGING 1:30 PM - Saturday, April 23, 1994 Health Education Room 110 Deborah L. Whitfield, Presiding

1:30 PERFORMANCE GROWTH OF 80X86 PERSONAL COMPUTERS SINCE 1981 VERSUS PRICE.

D. Kaur, D. Shaheen and Yong Park, Electrical Engineering, University of Toledo, 2801 W. Bancroft, Toledo OH 43606-3390.

The paper evaluates Performance Growth of IBM Personal computers since the introduction of IBM PC in 1981. Currently the highest performing 80X86 personal computer platform is 80486DX2- 66MHz. A synthetic bench mark called Dhrystone was used to measure the performance of these computers. Throughput of X is n% higher than Y, where, n the percent difference in execution of X and Y is calculated as follows: n= ((execution time B - Execution time A)/Execution time A)*100. Throughput is computed for all the IBM relative to IBM XT- 4.77 MHz. Our computation shows that the throughput of 80486DX2-66MHz is 9800% higher than the IBM XT. The 80486DX2-66MHz machine became available in early 1992, so the average growth rate of the 80X86 personal computers can be determined using the following algorithm: Yearly Growth=(Total Growth)$^{(1/\text{number of years})}$=(98)(1/11)=1.52. The 80X86 personal computer platform performance increased an average of 52% per year. Assuming this rate of growth will continue, the performance of the 80X86 in the year 2000 can be predicted to be 2750% relative to IBM XT.

1:45 A METHOD TO OBTAIN OPERATING POINT INFORMATION FOR TERTIARY STORAGE SYSTEMS.

Gerald R. Heuring, Dept. of Computer Science and Engineering, University of Toledo, 2801 West Bancroft Street, Toledo OH 43606.

The use of tertiary or near-line storage for files, only found on large computer systems in use at the national laboratories at one time, is becoming increasingly common on smaller computer systems. To determine the economic feasibility of such a system and the desired operational characteristics of a suitable storage device it is necessary to have information on the behavior of the files on the system. Previously, systems considered for addition of tertiary storage had reached a saturation point where the question was moot. Today, with the wide range of tertiary storage devices and their capabilities, determining if and when a system will benefit from tertiary storage is not as clear. A method utilizing sampling and multivariate analysis has been developed for and verified on existing file behavior data and will be presented. The results provide guidance on the specification and implementation of tertiary storage systems on computer systems with little information on previous file behavior. Results study will be presented along with observations of how the needed data may be gathered and analyzed.

2:00 OPTIMIZING COMPUTER PROGRAMS USING POWERFUL TECHNIQUES.

Deborah L. Whitfield, Dept. of Computer Science, Slippery Rock University, Slippery Rock PA 16057.

Currently, interest in parallelizing optimizations is growing with the recognition of the necessity of performing optimizations to effectively utilize parallel architectures. To exploit parallel architectures, powerful optimizations must be applied at the most effective location in the program and in the most beneficial order. Few guidelines exist for determining when and where to apply optimizations to produce the most efficient code; the order of applying optimizations can have an impact on the efficiency of the final code. However, determining the appropriate optimizations is difficult due to the complex interactions among the optimizations, scheduler and architecture. The introduction of more powerful parallelizing optimizations that consist of a combination of conventional optimizations further complicates the situation. Before the affects of powerful optimizations can be experimentally investigated, the properties which permit optimizations to be combined must be investigated and a tool that automatically generates these powerful optimizers must be designed. To aid in selecting appropriate optimizations, an optimizer generator (Genesis) is presented that produces an optimizer from specifications of optimizations. This paper describes the design and implementation of Genesis and demonstrate how such a generator could be used by optimizer designers that are interested in investigating the properties of optimizations that permit their combination and how Genesis could be used to automatically generate combined optimizers from the specification of simple optimizations.

2:15 ROBOT DESIGN: FROM START TO FINISH.

John K. Estell, Thomas A. Owen, Craig A. Szczublewski. Computer Science and Engineering Dept., University of Toledo, Toledo OH 43606.

An autonomous microprocessor-based controller, SCORPIO, was designed for operating a low-cost, multi-legged robotic system. SCORPIO is based upon the Stiquito hexapod robot developed at Indiana University. The main goal of the SCORPIO project was to provide a completely self-contained robotic system capable of interacting with its environment. Since the Stiquito's load capacity was limited, a new body was developed to accommodate a controller, sensor array, and power supply. The controller, based on the 80C32 microprocessor, was provided with all necessary resources to allow the robot to be programmed. To accomplish this programming, a new pseudo-assembly language was developed. The SCORPIO Language Assembler is a general purpose robot controller language designed to aid in program development. The sensor array consists of multiple IR emitter/detector pairs. These are designed for wave front detection, and allow for simple object avoidance. The basic controller design is flexible enough to be included in future robot designs with little or no modification to either hardware or software.

2:30 KNOWLEDGE SHARING BETWEEN EXPERT SYSTEMS.

Mary Lou Dorf, Computer Science & Engineering Dept., 2801 W. Bancroft, University of Toledo, Toledo OH 43606-3390.

The current information age demands new approaches to the acquisition, transfer, interpretation, processing, and use of data. With the assistance of networks and of known data formats, it is now possible to access, copy, and move information back and forth between databases, spreadsheets, word processors, and/or computer programs. However, the sharing of knowledge between expert systems remains at the primitive level. This sharing of knowledge can take place either by sharing knowledge bases between expert systems, or by allowing systems to query each other for information. However, there are impediments to this sharing of knowledge: representations, dialects, lack of communication conventions, and lack of shared vocabulary and domain terminology. Although this paper covers each impediment and suggest mechanisms for handling the difficulties, the concentration is on mechanisms for solving the difficulty of sharing vocabulary and domain terminology.

2:45 VISUALIZATION OF AIR FLOW IN COMMERCIAL KITCHEN ENVIRONMENTS.

Wayne E. Carlson, Peter Carswell, David Reed, Lawson Wade, Wen Seun, Advanced Computing Center for the Arts and Design, Ohio State University, 1224 Kinnear Rd., Columbus OH 43212.

An interactive environment for designing and analyzing heat collection and dissipation in a commercial kitchen has been implemented. KitchenVIEW is used in the design of energy efficient kitchens, allowing a designer or architect to set up a *virtual* kitchen using a graphical interface, and then to compute and visualize the airflow and other information that would occur in a real kitchen with that design. Using kitchenVIEW, many different kitchen setups can be tested to find one that optimizes efficiency, without the need to physically build and test them. KitchenVIEW is tailored for use with commercial kitchens; however, it could be used to visualize other environments. The user specifics a floor plan for the room, interactively positioning various appliances within the 3D space. After the initial design is completed, there are graphical tools for specifying a gross computational grid and related initial conditions, such as temperature, pressure, exhaust and inflow rates. These tools display a cross-section of the room including the appliance, which is used to the user specify a two dimensional grid and the initial conditions at the grid points for that slice. The program then creates a 3-dimensional grid by connecting the 2-dimensional slices. This information is given to a separate computational fluid dynamics (CFD) program which refines the grid and computes the airflow, temperature and pressure at the grid points. KitchenView is finally used to visualize the output of the CFD program (currently as a vector plot.) Particle animations and contour plots are being added to the visualization.

3:00 SIMULATION OF VIRTUAL ENVIRONMENTS FOR USE IN WHEELCHAIR USER PROFICIENCY.

Wayne E. Carlson, Donald Stredney, Edward Swan, Edward Sindelar, Cynthia Hayes, Advanced Computing Center for the Arts and Design and Ohio Supercomputer Center, Ohio State University, 1224 Kinnear Rd., Columbus OH 43212.

This experimental project examines human performance in negotiating barrier free environments through the use of computer generated virtual simulations. Architectural plans of public and commercial buildings are entered into the system to provide a complete three dimensional environment in which the wheelchair user must navigate. A powered wheelchair is connected to a computer workstation, and the outputs of the operation controls are converted to commands to the graphics software. A resulting three dimensional view of the building is presented to the user via a stereo view image device. User performance data is collected and integrated by the training system to give feedback to the user, as well as to provide essential information regarding the design of these technologies. The project will be instrumental in defining standards for use in evaluating user proficiency, which will provide information for more suitable selections of enabling technology for the disabled. In addition, this research will demonstrate direct implications to the development of enabling technology through virtual testing and analysis. The system developed for this project can be used by architects, developers, designers and builders to assure barrier free environments in order to assure unlimited access to these environments (public buildings, shopping malls, homes and offices, retail stores, etc) by the disabled.

3:15 BIOMEDICAL SIMULATIONS OF HIGH PERFORMANCE COMPUTING.

Don Stredney, Roni Yagel, Greg Wiet, M.D., Edward Swan, Ferdi Sheepers, Ohio Supercomputer Center, 1224 Kinnear Rd., Columbus OH 43212-1163.

At the Ohio Supercomputer Center, and the College of Medicine and the Advanced Computing Center for the Arts and Design at The Ohio State University, a system is under

development to provide an intuitive interface for manipulating and experiencing virtual data sets, specifically volume reconstructions of multi-modal medical data. This design requires a minimum of setup time and user calibration. Initial user settings are stored on-line, and can be readily modified to accommodate user differences. Current research topics include the following: The Correlation of functional (EEG) and structural (MRI) images to investigate the pathophysiology associated with drug addiction (in collaboration with the Alcohol and Drug Abuse Research Center, Harvard Medical School). Teaching regional anesthesia, specifically the technique of an epidural block (in collaboration with the Department of Anesthesiology, The Ohio State University Hospitals). Visualizing and determining tumor morphology in patients with skull based and intracranial tumors (in collaboration with the Departments of Neurosurgery and Otolaryngology, The Ohio State University Hospitals, and The Arthur James Comprehensive Cancer Hospital and Research Institute).

3:30 REMOTE DIAGNOSIS USING VOLUME VISUALIZATION OF SATELLITE TRANSMITTED MEDICAL DATA.

Wayne E. Carlson, Roni Yagel, Stephen May, Stephen Spencer, Don Stredney, Charles Bender, Advanced Computing Center for the Arts and Design and Ohio Supercomputer Center, Ohio State University, 1224 Kinnear Rd., Columbus OH 43212.

An experiment is underway to provide tools and techniques for medical diagnosis of patients in a medically deprived remote area of Hawaii by utilizing the NASA ACTS satellite to transmit medical scanner image data for visualization and analysis by experts at a separate site. In this experiment, a mobile unit employing very-low field MRI or ultrasound imaging is used to obtain two dimensional images of an injured patient. These image data sets are then transmitted over the High Data Rate terminal to the ACTS satellite, and then to the Ohio Supercomputer Center where a parallel volume rendering algorithm is used to construct a three dimensional model of the patient. These resulting images are broadcast back to the initial remote site for the attending physician to view and manipulate. In addition the images are simultaneously sent to Georgetown University for evaluation and analysis by a team of expert radiologists. Their resulting treatment plan is sent via the satellite with other collaboration information to the remote site to be used in a medical triage situation. In addition to real time parallel rendering, the experiment will allow for segmentation of these data sets, resulting in the ability of the physician to concentrate attention on certain tissues or organs that might be affected by the injury. The experimental rendering algorithms are also able to combine data from multiple modalities (eg, MRI and EEG data) in a single three dimensional rendering, providing an even greater opportunity for correct diagnosis and treatment planning.

3:45 MAP SCALE CHANGE, "RADICAL LAW" AND FRACTALS.

Yu Zhou, Dept. of Geography, Bowling Green State University, Bowling Green OH 43403.

Scientists need to look at the world at a very wide range of spatial scales. This task frequently involves scale change—a traditional operation in cartography. Automation of map scale change, however, has many unsolved problems. Friedrich Topfer, a German cartographer, declared that the relationship between map scale and map information content can be expressed, fundamentally, as a "square root" function. His idea, although not examined to any high level of criticism, has been generally accepted in the cartographic community as "Radical Law". By analyzing U.S. Geological Survey maps at different scale levels, this investigation finds that the relationship between map scale and information content fits a power function rather than radical one. The so-called "Radical Law", therefore, needs to be adjusted. This power function, furthermore, suggests that the scale-information relationship is fractal in nature. Like the D-value (a parameter employed by fractal geometry as a measure for the character of a line or a surface), the p-value, a parameter derived from Topfer's equation, can be served as an indicator to describe the degree of information reduction caused by scale change. An important contribution to the problem of deriving a map at any required scale from a single large-scale database has, therefore, been made.

ERGONOMICS, COMPUTERS, and LIBRARY & INFORMATION SCIENCES

9:00 AM - Saturday, April 23, 1994

Health Education Room 110

Bruce A. Leach, Presiding

9:00 RANDOLPH GREENFIELD ADAMS OF THE WILLIAM L. CLEMENTS LIBRARY: SENTIMENTAL BOOKMAN-SCHOLAR.

Robert A. Shaddy, Ward M. Canaday Center, Carlson Library, University of Toledo, Toledo OH 43606.

Randolph Greenfield Adams (1892-1951), historian and librarian, became the first director of the William L. Clements Library at the University of Michigan in 1923 and served there until his death. During his tenure he took up the cause of the rare-book collector and devoted himself to the preservation of rare books and other special collections thus opposing the major trend in American librarianship at that time of the primacy of service to the reader. His numerous publications, addresses, and other works repeatedly stated that the care of rare materials should be put before the desires of readers and librarians. His most famous statement on this theme was the classic article "Librarians as Enemies of Books," which was published in 1937. His efforts contributed to the institution of reforms throughout the country which helped convince collectors that their collections would be cared for properly by librarians. By the middle of the twentieth century, more collections of rare materials were institutionalized by their owners (rather than being put up for auction) than at any other time in American history. This paper briefly explores Adams as a "custodian of culture" and his views regarding rare books librarianship.

9:15 IDENTIFYING CD-ROM USE PATTERNS AS A TOOL FOR EVALUATING USER INSTRUCTION.

Bruce Leach, Biological Sciences Library, Ohio State University, 1735 Neil Ave., Columbus OH 43210.

All CD-ROM database use in the Biological Sciences Library is recorded on daily workstation "reservation" logs. Workstation logs from January 1987 through June 1991 were used to determine use patterns of individual database searchers. Names of searchers and dates of use were entered into a *WordPerfect™* file, then sorted. For each individual, the number of days on which databases were searched, the interval between first and last database use, and the number of academic quarters in which the user searched databases were calculated. 1501 individuals were identified. More than half of the observed CD-ROM searchers recorded all database use within one month. Over one-third recorded use on only one day. Results suggest that the library emphasize brief basic instruction for all first-time searchers and de-emphasize workshops.

9:30 USING THE INNOVACQ LIST CREATION ABILITY TO OBTAIN LISTS OF PERIODICAL ARRIVALS.

Dale Ebersole, Jr. Carlson Library, University of Toledo, Toledo OH 43606.

The list creation ability of the INNOVACQ system can be utilized to generate lists of arriving periodicals for interested faculty. At this institution a departmental identifier from the order record and the date of latest arrival from the check in record can be utilized to create such a list. Use of a definite time frame would allow only those issues that arrived since a specified beginning date to be listed. All issues that arrived during the past week, 2 weeks, month, etc. would be listed alphabetically by title with arriving issue identification. Some ways in which these lists could be utilized are mentioned. They will be constrained by equipment availability, cost, possible legal restrictions, and the availability of people to perform necessary input tasks.

9:45 ACCESSING ETHNIC INFORMATION SOURCES IN MIDWESTERN CULTURAL INSTITUTIONS.

Lois J. Buttlar and Rajinder Garcha, School of Library and Information Science, Kent State University, Kent OH 44242-0001.

Cultural pluralism in the United States is based on the appreciation of a rich variety of ethnic peoples—their traditions, arts, languages and histories. Changing demographics and the new immigration waves of the eighties and nineties have brought attention to various nationality groups. Unfortunately, librarians, scholars, and educators do not have access to the valuable resources in many of the ethnic institutions because their holdings are not analyzed by indexing and abstracting services. The proposed presentation is a description of the ethnic museums, archives, and libraries in the Midwest, including their collections, availability to the public, admission charges, programs, and services provided (guided tours, exhibits. lectures, loans, etc.).

10:00 MISCONCEPTIONS IN HUMAN FACTORS,

Henry F. Ledgard, Ph.D., Computer Science and Engineering Dept., University of Toledo, Toledo OH 43606.

The field of computers has seen a rapid growth in graphical user interfaces and an ever widening set of users. Many, many people spend hours a day using a computer. Ease of use is a paramount issue. We hold that there are major misconceptions in the field. They are largely unspoken, and may reflect a set of established attitudes in our profession. Some of these misconceptions are: 1. The primary goal of human factors is to help novices; 2. Ease of learning implies ease of use; 3. Regular computer users do not really need human factors; 4. Most graphical interfaces are pretty easy to use; 5. Users should help design systems; 6. Human engineering centers on a few key issues; 7. Users will be comfortable with subsets; 8. Human engineering is not particularly a technical matter; and 9. Human factors are chiefly a matter of taste; We need to make computers better for people. To do this we need to understand such misconceptions and make a serious attempt to improve the situation.

10:15 KNEELING, AN ALTERNATIVE TO SITTING.

Henry F. Ledgard, Ph.D. and Bernie V. Falk, M.A., Computer Science and Engineering Dept., University of Toledo, Toledo OH 43606

Sitting is a major health hazard. Prolonged sitting induces general weakness, poor posture, poor walking habits, and lack of energy. Prolonged sitting is detrimental to one's health and well-being. Office work and the field of computers has resulted in a rapid increase in sitting. Many people spend hours a day sitting. I have been experimenting with using the computer kneeling down. It is wonderful. It takes time to develop the strength in the knees, legs, and feet in order to be able to kneel for periods of ten or twenty minutes. it hard at first. Frequent movement makes the situation much easier The results are directly visible. One definitely feels better. We need to make office work better for people. To do this we need to take the sitting issue seriously and improve the situation. This work is based on and derived from the work of Bernie V. Falk, M.A., of Grosse Pointe Park, Michigan.

10:30 CROSS-DOMINANCE - A MAJOR HEALTH ISSUE. Bernie v. Falk, M.A. and Henry F. Ledgard, Ph.D., Computer Science and Engineering Dept., University of Toledo, Toledo OH 43606.

The hypothesis of this work is that cross-dominance induces a high level of stress. This hypothesis, if true, has far reaching consequences. Every person has a dominant eye. The dominant eye in most people is the eye that the individual uses to sight with a camera. Almost every individual also has a dominant hand. This is the hand the individual uses in handwriting. We say that a person is "cross-dominant" if the dominant eye and dominant hand are on opposite sides. Bernie Falk estimates that one out of four or five persons is cross-dominant. We believe cross-dominance influences people in many serious ways. It is a major factor in psychological difficulties, learning disabilities, behavioral problems in children, coordination in sports, and general anxiety. Cross-dominant individuals can never really relax. They are always in a state of chronic stress. Quite remarkably, most cross-dominant people are not aware directly of their stress or the possible influence of their cross-dominance on their level of stress.

10:45 Poster Break

Medical Sciences and Health Technologies Division

CARDIOLOGY - MEDICINE
1:30 PM - Saturday, April 23, 1994
Lucas
Blair P. Grubb, Presiding

1:30 DETERMINATION OF AUTONOMIC ACTIVITY IN PATIENTS WITH NEURALLY MEDIATED SYNCOPE BY SPECTRAL ANALYSIS OF HEART RATE VARIABILITY. Blair Grubb, Daniel Kosinski, Daniela Samoil, Rodger D. MacArthur, Harry Hahn, Laura Elliot, Medical College of Ohio, PO Box 10008, Toledo OH 43699.

Heart rate variability (HRV) analysis measures R-R interval variability as a correlate of cardiac autonomic modulation. Power spectral analysis (PSA) of HRV is an analysis of R-R intervals using fast Fourier transformation represented as a frequency distribution with discreet sympathetic (low .04 - .15 Hz) and parasympathetic (high .15 - .40 Hz) frequency components. We analyzed HRV by PSA in 57 pts. undergoing head upright tilt testing (HUTT). Analysis was performed during a supine 6 min. interval immediately prior to HUTT, and a 6 min. interval immediately following elevation to an 80 degree tilt angle. HUTT was continued for 45 min. or until syncope occurred. The analysis was to determine if pts. with syncope had differences in baseline autonomic tone or immediate response to orthostatic stimulus, at the time of HUTT, when compared to HUTT negative pts. Results are expressed as a ratio of low/high power which reflects relative sympathetic modulation.

	Syncope	No Syncope	P
Supine	1.22	1.72	0.003
80° tilt angle	1.81	2.32	0.014

One way analysis of variance with repeated measures found a significant difference between the groups.

1:45 COMPARISON OF AUTONOMIC MODULATION IN SUBGROUPS OF PATIENTS WITH NEURALLY MEDIATED SYNCOPE UTILIZING SPECTRAL ANALYSIS OF HEART RATE VARIABILITY. Blair Grubb, Daniela Samoil, Daniel Kosinski, Rodger D. MacArthur, Laura Elliott, Harry Hahn, Medical College of Ohio, PO Box 10008, Toledo OH 43699.

Head upright tilt testing (HUTT) is used to diagnose neurocardiogenic syncope. Three basic response patterns to HUTT have been identified: a cardioinhibitory, a vasodepressor, and a mixed response in which both features are prominent. Power spectral analysis (PSA) of heart rate variability (HRV) is a fast Fourier transformation analysis of R-R intervals represented as a frequency distribution with discreet sympathetic (low .04 - .15 Hz) and parasympathetic (high .15 - .40 Hz) frequency peaks. We studied 32 pts. with syncope during HUTT. PSA was performed during a supine 6 min. interval prior to HUTT and a 6 min. interval immediately after elevation to an 80 degree angle. Analysis was performed to determine if differences existed between the sub-groups in terms of baseline autonomic tone or response to HUTT. Initial results are expressed in a ratio of high/low power which reflects sympathetic activity.

	Supine	80°tilt	P
Vasodepressor	1.25	1.91	NS
Cardioinhibitory	1.16	1.81	NS
Mixed	1.24	1.76	NS

One way analysis of variance with repeated measures yield no difference between the groups.

2:00 IS SUCCESSFUL PHARMACOLOGIC TREATMENT OF NEURALLY MEDIATED SYNCOPE DUE TO AN ALTERATION IN BASAL AUTONOMIC TONE. Daniel Kosinski, M.D., Daniela Samoil, M.D., Blair P. Grubb, M.D., Rodger D. MacArthur, M.D., Laura Elliot, R.N., Harry Hahn, R.N., Medical College of Ohio, PO Box 10008, Toledo OH 43699.

Heart rate variability (HRV) analysis measures R-R interval variability as a correlate of cardiac autonomic modulation. Power spectral analysis (PSA) of HRV is an analysis of R-R intervals using Fast Fourier transformation represented as a frequency distribution with discreet sympathetic (low 0.04-0.15 Hz) and parasympathetic (high 0.15-0.40 Hz) frequency components. We analyzed HRV by PSA in 4 patients undergoing head upright tilt testing (HUTT). Analysis was performed during a supine 6 min. interval immediately prior to HUTT, and a 6 min, interval immediately after elevation to an 80 degree angle. Patients were analyzed during their initial HUTT, in which all were positive, and on repeat testing during medial therapy. On repeat testing all patients were negative. The analysis was to determine if conversion to a negative test was due to an alteration in basal autonomic tone as measured by supine analysis and immediate response to orthostatic stress. Results are expressed as a ratio of low/high frequency power.

	Tilt #1 (Pos)	Tilt #2 (Neg)
Supine	1.36	1.46
Upright	2.17	2.76

Paired T test analysis revealed no significant difference in the response patterns. However, the results may be affected by the sample size.

2:15 THE USE OF SEROTONIN RE-UPTAKE INHIBITORS FOR THE TREATMENT OF RECURRENT SYNCOPE DUE TO CAROTID SINUS HYPERSENSITIVITY UNRESPONSIVE TO DUAL CHAMBER PACING. Blair P Grubb, M.D., Daniel Kosinski, M.D., Daniela Samoil, M.D., Peter Temesyarmos, M.D., Medical College of Ohio, PO Box 10008, Toledo OH 43699.

Cardiac sinus hypersensitivity (CSH) may be a cause of syncope in older patients (pts). Dual chamber pacing may relieve the bradycardia, but not the vasodilatory component of this disorder. Serotonin may play an important role in mediating this disorder. Three pts with CSH who had recurrent syncope after dual chamber pacing dur to excessive vasodilation were placed on serotonin reuptake inhibitors (either fluoxetine 20 mg/d or sertraline 50 mg/d). After 46 weeks, all three have experienced resolution of symptoms. In addition, carotid sinus massage failed to provoke syncope in each. We conclude that serotonin reuptake inhibitors may be useful in the therapy of CSH resistant to dual chamber pacing.

2:30 THE USE OF SERTRALINE HYDROCHLORIDE IN THE TREATMENT OF REFRACTORY NEUROCARDIOGENIC SYNCOPE IN CHILDREN AND ADOLESCENTS. Blair Grubb, Daniela Samoil, Daniel Kosinski, Katrinka Kip, Medical College of Ohio, PO Box 10008, Toledo OH 43699.

The purpose of our study was to determine if the serotonin reuptake inhibitor, sertraline, could prevent neurocardiogenic syncope in children and adolescents resistant to, or intolerant of other therapies. The serotonin reuptake inhibitor, fluoxetine hydrochloride, has been reported effective in preventing neurocardiogenic syncope in older adults. Seventeen young patients (pts) (mean age 15 yrs, range 10 - 18 yrs, 7 male, 10 female) with recurrent syncope and a positive head upright tilt table test were referred for study in whom standard therapies (fludrocortisone, transdermal scop-olamine, beta blockers, disopyramide) were ineffectual, poorly tolerated, or contraindicated. Sertraline hydrochloride was administered at 50 mg po daily for 56 weeks. Head upright tilt table test was then re-performed as previously and the clinical effect also noted. Three pts. (18%) were intolerant of the drug and it was discontinued. Nine pts. became asymptomatic and tilt negative (52%), while 5 remained tilt positive (29%). Over a mean follow up period of 12+/-5 months, the tilt negative pts. remained symptom free while taking sertraline. The serotonin reuptake inhibitor sertraline hydrochloride is effective in preventing recurrent neurocardiogenic syncope in selected young pts. unresponsive to, or intolerant of other therapeutic modalities.

2:45 PREVENTION OF UPRIGHT TILT-INDUCED SYNCOPE WITH NIMODIPINE: EVIDENCE FOR A CEREBROVASCULAR MECHANISM? Daniela Samoil, *Blair P. Grubb, Gary Gerard, Daniel Kosinski, Harry Hahn, Laura Elliott, Medical College of Ohio, PO Box 10008, Toledo OH 43699.

In order to evaluate the potential role of the cerebrovasculature in the pathophysiology of vasovagal syncope, we observed the effects of nimodipine, a cerebral artery vasodilator, on upright tilt-induced syncope. Five patients with recurrent syncope (3 men and 2 women, mean age 34+/-16 years) who had upright tilt-induced hypotension/bradycardia with concomitant cerebral arteriolar vasoconstriction on transcranial Doppler ultrasonography (TCD) were treated with oral nimodipine, 30 mg every four hours for three days. Repeat tilt table testing and TCD

were then performed under the same conditions as the initial tilt. Syncope was prevented in 4 of 5 patients (80%) during the repeat study, and TCD showed no evidence of cerebral vasoconstriction. This suggests that cerebral arteriolar vasoconstriction may play an important role in the production of vasovagal syncope, and that oral nimodipine may be useful in patients resistant to other forms of pharmacotherapy.

3:00 HEART RATE VARIABILITY AND UPRIGHT TILT TESTING AS INDICATORS OF INAPPARENT AUTONOMIC DYSFUNCTION IN PATIENTS WITH ADVANCED HIV INFECTION.

Daniela Samoil, Rodger MacArthur, *Blair Grubb, Lynn Lipton, Laura Elliott, Harry Hahn, Medical College of Ohio, PO Box 10008, Toledo OH 43699.

We performed head upright tilting and concomitant heart rate variability analysis (fast Fourier transform) on HIV-infected males (mean CD4 count = 317/μL) and on uninfected age-matched male controls (mean age = 35 years) to test for HIV-related autonomic dysfunction prior to the development of clinical symptoms. The rate of tilt-induced syncope (21%) did not differ between infected and uninfected subjects. Infected fainters developed symptoms sooner than did uninfected fainters (8 minutes vs. 21 minutes, $p < 0.10$). Among infected subjects, syncope was more frequent in those with CD4 counts < 5O/μL compared to those with counts >/= 50/μL (50% vs. 12%, $p = 0.05$). Compared to controls, HIV-infected subjects demonstrated a *relative resting tachycardia, and a relative inappropriate heart rate response with tilting*, associated with a systolic blood pressure drop. The low-frequency amplitudes of resting heart rate variability in HIV-infested persons were significantly correlated with CD4 counts, with the lowest values associated with the lowest counts ($r = 0.881$ $p < 0.001$). We conclude that persons with advanced HIV infection have a high rate of autonomic dysfunction and abnormal heart rate variability patterns.

3:15 A COOPERATIVE NEEDS ASSESSMENT STUDY TO IDENTIFY HIV PREVENTION STRATEGIES.

Judy L. Adams, Glen Shields, Dan Rutt, Ben Walter, Dept. of Medical Technology, 504 Life Science Building, Bowling Green State University, Bowling Green OH 43403.

Identification of HIV prevention needs and strategies associated with various populations and agencies in a Northwest Ohio metropolitan area was made by a joint effort between a county health department and a university's faculty. Different survey instruments for 10 target populations were developed and distributed to over 30 community groups. Populations included in the study represented the criminal justice system, Latino and African-American groups, schools, youth at risk, gay/bisexual persons, substance users, HIV positive individuals and persons with AIDS, clergy, elected officials, employers, physicians, service agencies, women in high risk situations, and homeless persons. The purpose of the assessment was to determine unmet informational needs and degree of high risk behavior. Over 3000 completed instruments were analyzed. Data were analyzed using frequency and percentages, as well as determinations for significance of comparisons. Not unexpectedly, data indicate a reasonable amount of knowledge without personal application.

3:30 PREDICTION OF BLOOD PRESSURE RESPONSE OF INDIVIDUALS WITH ESSENTIAL HYPERTENSION TO STRESS MANAGEMENT THERAPY.

Robert C. Spain, Jr., M.Ed., LPC and Angele McGrady, Ph.D., Medical College of Ohio, PO Box 10008, Toledo OH 43699-0008.

Stress management therapy has been shown to benefit individuals with high blood pressure (BP). Decreases in BP are observed in more than half of stage 1 (mild) and state 2 (moderate) hypertensive persons after 12 treatment sessions and home practice. Since therapy requires a significant time commitment, it is important to determine characteristics of patients that predict success or failure. Seventy patients, 24 males, 46 females, 19 blacks and 51 whites, were provided with group stress management therapy consisting mainly of relaxation and biofeedback. Patients were trained to lower physiological arousal. Forty-nine percent of the patients were successful in lowering mean arterial pressure by at least 5 mm Hg. Multiple regression analysis was conducted to develop the prediction equation. Factors analyzed reflected the level of physiological arousal, in particular the activity of the sympathetic nervous system, thought to be involved in mild to moderate hypertension. Predictor factors were not different by gender, only by race. In whites, decreased BP was predictable by pretreatment BP and higher levels of physiological arousal. No predictor factors were found for blacks. Development and use of predictor models is cost and time effective and applicable to recommending treatment to patients with essential hypertension.

3:45 IMIPRAMINE PLASMA CONCENTRATIONS AND RESPONSE IN PANIC DISORDER.

Matig R. Mavissakalian & James M. Perel, Ohio State University, College of Medicine, Columbus OH 43210.

Plasma concentrations of Imipramine (IMI) and N-desmethyl-imipramine (DMI) were assessed in 48 panic disorder with agoraphobia patients who completed an 8 week randomized double blind dose ranging study with imipramine hydrochloride: low dose (0 5 mg/kg/day, n=17) medium dose (1.5 mg/kg/day, n=17) and high dose (3 mg/kg/day. n=14). Assessments included patient and clinician rated symptom scales of panic and phobias, as well as operationalized criteria of response, which were based on ./- 50% change from baseline to signify marked improvement or an absolute cutoff score to signify minimal to absent symptoms. Analysis included correlational and dose-response stratifications with total, IMI and DMI concentrations as well as multiple linear regression and logistic regression analysis with total, IMI and DMI levels as predictors of symptom severity and response. Results revealed a sigmoidal/linear relationship between total plasma levels and response in panic and a curvilinear relationship between total plasma level and response in phobias (such that maximal response was achieved in the 75-133 ng/ml range, with diminished response below and above this range). The curvilinearity of phobic response was associated with the highest concentrations of DMI while the IMI-response curve remained linear or sigmoidal. The results have practical implications vis a vis the selection of optimal plasma levels in the acute treatment of panic disorder with agoraphobia and likewise suggest separate and different mechanisms for imipramine's antipanic and antiphobic effects.

4:00 RENAL ARTERY STENOSIS PRESENTING AS ANGINA TREATED BY RENAL ARTERY STENTING.

Gary Ansel, M.D., Sanjeev Puri, M.D, Medical College of Ohio, PO Box 10008, Toledo OH 43699-0008.

Renal artery stenosis is a common but frequently overlooked cause of reversible hypertension. We present a patient where renal artery stenosis presented as unstable angina. A 52 year old white female presented with daily angina attacks, hypertension, and a history of frequent hospitalization. Coronary angiography showed diffuse non critical atherosclerosis of a small right coronary artery. Occluded circumflex and the left anterior descending were diffusely narrowed with a diagonal branch that was small with a 90% stenosis. These lesions were not amenable to coronary bypass grafting. A renal angiogram was done which revealed left renal artery stenosis with 70% narrowing and 50 mm Hg gradient. Renal artery angioplasty resolved with stent placement was done; patient's anginal symptoms and hypertension improved markedly. This patient provides important insight into the recognition of the role of renal artery stenosis in the manifestations of coronary artery disease. Renal artery disease is associated with persistent high renin and angiotensin levels. Angiotensin exerts a direct coronary vasoconstrictor effect on the large epicardial vessels and small resistance vessels. Relief of renal artery stenosis would decrease the angiotensin levels, thus increasing the coronary vascular flow. With improved nonsurgical techniques such as vascular stent placement, clinicians need to be aware of renal artery stenosis manifesting as angina.

4:15 ACUTE INDUCIBLE PORPHYRIAS: ANESTHETIC PROTOCOL FOR CORONARY ARTERY GRAFTING.

Martha Kreimer-Birnbaum and Michael R. Lust, Research Dept., St. Vincent Medical Center, Toledo OH 43608, J. Robert Sneyd, Dept. of Anesthesiology, University of Michigan, Ann Arbor MI, Joseph Heflin, Dept. of Internal Medicine, Providence Hospital, Southfield MI.

The acute hepatic porphyrias are a group of pharmacogenetic disorders of heme metabolism. Patients who are carriers of acute porphyrias are placed at risk by general anesthesia because some induction agents may cause episodes of abdominal pain, neuropathy, or even fatal respiratory paralysis. In the present study, eight family members were examined. The patient is one of five found to be a Variegate Porphyria carrier and he had coronary artery grafting. The patient was given sufentanil, atracurium, and isoflurane. The course of anesthesia was uneventful; he made a full post-operative recovery and remained free of porphyria-related symptoms during subsequent months. There is no evidence that the use of sufentanil, atracurium and isoflurane either precipitates an attack of porphyria or harms nerve tissue in humans. The anesthetic protocol described here may be an acceptable drug combination for carriers of other inducible porphyrias undergoing heart surgery. (Supported in part by a grant from the F.M. Douglass Foundation).

4:30 COPROPORPHYRINOGEN III (COPRO'GEN) OXIDASE: A SIMPLIFIED ASSAY FOR THE DETECTION OF COPROPORPHYRIA.

Martha Kreimer-Birnbaum and Michael R. Lust, Research Dept., St. Vincent Medical Center, 2213 Cherry St., Toledo OH 43608, J. Maria Tomio University of Buenos Aires, Dept. of Biological Chemistry, Buenos Aires 1428, Argentina.

Copro'gen III oxidase catalyzes the conversion of copro'gen III ultimately to protoporphyrin IX (Proto). In carriers of coproporphyria, enzyme activity is approximately half that of normal persons. The assay involves harvesting lymphocytes with Histopaque® and Acouspin® tubes. Lymphocytes are serially washed with phosphate buffered saline and centrifuged, resuspended in a TRIS buffer and incubated with copro'gen III. A dilute HCl solution is used both to stop the reaction and to extract the Proto, which is run in a gradient HPLC system. The mean +/- S.D. activity of controls was 269+/-61 pmoles Proto/hr/mg protein (n = 19). Detection of carriers in a family with coproporphyria has been attempted with this assay. The assay conditions make this method simpler and quicker than those using organic extract ants, followed by quantitation of the reaction products as porphyrin esters. (Supported in part by the American Porphyria Foundation and the F M. Douglass Foundation).

4:45 *KANPO* MEDICINE IN JAPAN.

T. Neal Garland, Dept. of Sociology, University of Akron, Akron OH 44325.

Kanpo medicine, based on traditional Chinese medicine, has a long history in Japan. The national government tried twice to eradicate it—once in the late 1800s after the Meiji Restoration and once in the 1940s after the Pacific War. However, *Kanpo* has survived because it is deeply rooted in Japanese culture. The basic assumptions about causes of disease and the treatments utilized are quite different from those of Western medicine. A brief description of these assumptions and treatments is presented in this paper.

ENDOCRINOLOGY - BIOCHEMISTRY
9:00 AM - Saturday, April 23, 1994
Defiance

Lee A. Meserve, Presiding

9:00 INFLUENCE OF PRE-AND/OR POST-WEANING POLYCHLORINATED BIPHENYL (PCB) ON THYROID STATUS, BODY WEIGHT AND FOOD CONSUMPTION IN 60 DAY OLD RATS. Deborah A. Corey, Laura M. Juarez de Ku, and Lee A. Meserve, Dept. of Biological Sciences, Bowling Green State University, Bowling Green OH 43403-0212.

Improper disposal of polychlorinated biphenyl, (used extensively for many industrial purposes), resulted in extensive contamination of the environment. Symptoms of PCB exposure in humans as well in rats, include hypothyroidism, reduced body weight, and a decrease in food consumption. Since a decrease in body weight and food consumption was previously seen in 15 day old rats, we measured these parameters of rats 60 days old. Whether or not removal of PCB at weaning had a normalizing effect on these parameters was also determined. Pregnant rats were fed either 0, 125, or 250 ppm Aroclor 1254 from day one of pregnancy through weaning. Young rats were weighed daily and either left on the PCB diet or given regular lab mash at weaning (28 days of age). food consumption was measured every day for both the dams (first day of gestation to weaning) and the pups (days 17 through 60.) At 60 days of age, thyroid weight, and circulating T_3 and T_4 levels were determined. Growth rates were subnormal in rats given 125 or 250 ppm, and removal of PCB at weaning normalized the weights. As previously shown, PCB severely depressed T_4 and, to a lesser extent T_3, in a dose dependent manner, and PCB withdrawal at weaning restored both levels. The mechanisms by which PCB influences thyroid weight, circulating thyroid hormones, body weight and food consumption remain unclear, but may depend upon altered thyroid status.

9:15 SHORT PHOTO PERIOD INDUCED WEIGHT LOSS IN DEER MICE (*PEROMYSCUS MANICULATUS*): EFFECT OF COLD TEMPERATURE. Andrew I. Korytko, Thomas P. Ruf, and James L. Blank, Dept. of Biological Sciences, Kent State University, Kent OH 44242.

Individual deer mice, *Peromyscus maniculatus*, exhibit a broad range of gonadal responses to short photo period, resulting in different reproductive phenotypes. Approximately one third of all individuals respond with complete gonadal regression (responsive), while an equal number remain reproductively competent (nonresponsive). The remaining individuals display an intermediate reproductive state (intermediate). However, we have demonstrated that all individuals respond to short photo period in other nonreproductive characters, one of which is a decrease in body weight. Each reproductive phenotype, regardless of gender, displays a unique weight loss pattern. In males, we have demonstrated that short day weight loss is dependent on endogenous steroid levels and that short day induced alterations in food intake cannot completely account for observed degrees of weight loss. Moreover, when exposed to cold temperatures, nonresponsive males do not lose weight, however food consumption significantly increases. In contrast, responsive males lose a similar amount of weight and food intake is reduced, but do not differ from short day and warm exposed responsive males. Taken together, these data demonstrate that (1) reproductive phenotypes differ in the extent of short day induced weight loss and changes in food intake under warm temperatures and (2) cold ambient temperature causes differences among phenotypes to become more pronounced. This suggests that deer mice phenotypes uniquely undergo a series of metabolic adjustments under both short photo period and cold ambient temperature.

9:30 THERMAL DEPENDENCE OF CO_2 STORES IN REPTILES. Michael Grguric and Jerry Stinner, Dept. of Biology, University of Akron, Akron OH 44325-3908.

We have previously shown that acutely raising body temperature in air-breathing poikilotherms reduces their total body CO_2 stores. This conflicts with earlier studies, which have typically found no changes in bicarbonate levels, and which have lead to general theories of acid-base regulation such as the "alphastat" model. Our findings may conflict with others because: 1) acid-base adjustments differ between the extracellular and intracellular compartments, and 2) the rapid 20 to 30°C temperature changes that we employed are unrealistic and stressful. We tested these hypotheses by estimating whole body CO_2 chances with moderate elevations in body temperature and in species in which plasma $[CO_2]$ is unaffected by temperature. The three species tested were the Greek tortoise (*Testudo graeca*), American alligator (*Alligator mississippiensis*) and common snapping turtle (*Chelydra serpentina*). We found that heating the animals by 10°C lowered CO_2 stores and that all three species exhibited an inverse relationship between temperature and CO_2 stores, although the greatest changes appeared to occur in those species in which extracellular CO_2 content changes. We thus conclude that our previous findings cannot be explained as a stress response and that the extracellular and intracellular fluid compartments may behave independently with respect to acid-base adjustments.

9:45 PROPERTIES OF THE 6-HYDROXYDOPAMINE SULFOTRANSFERASE ACTIVITY IN RAT LIVER. J. L. Williams, J. Hagedorn, D. Smith, P. Springhart, & S. S. Singer, Chemistry Dept., University of Dayton, Dayton OH 45469.

The catecholamine cousin, 6-hydroxydopamine (6HD) causes experimental Parkinsonism. The study of 6HD sulfotransferase activity in the rat seemed valuable to us because it may alter the biochemistry of 6HD, leading to some possible chemotherapeutic applications. We identified liver as the best enzyme activity source and demonstrated a male-dominant sex dimorphism. Then, we extracted and partly purified the main 6HD sulfotransferase from rats of both sexes. After purification, the enzyme was tested to identify some of its biochemical properties. These were effects of pH and metal ions, as well as KmS for 6HD and reaction coenzyme. Thin layer chromatography was used to identify the 6HD sulfates made. The enzyme is compared to other rat liver sulfotransferases (Support was from the U.D. Research Council and Honors Program).

10:00 STUDY OF 6-HYDROXYMELATONIN SULFATION IN RAT LIVER. J. Hagedorn, D. Smith, J. L. Williams, & S.S. Singer, Chemistry Dept., University of Dayton, Dayton OH 45469.

Melatonin has been shown to inhibit human breast and prostatic tumors, as well as the development of rodent mammary glands. Because sulfation of 6-hydroxymelatonin (6HM), a major melatonin metabolite reduces melatonin levels, we felt that exploration of the enzymes that catalyze the production of 6HM sulfate would help us to understand carcinogenesis. Hence, we designed an enzyme assay for the measurement of 6HM sulfation. Then, study of 6HM sulfotransferase activity identified liver as the best enzyme source and a male-dominant sex dimorphism was observed. We also partly purified the main enzyme that catalyzed 6HM sulfation, identified effects of pH and metal ions on the enzyme, as well as K_mS for 6HM and reaction coenzyme. The enzyme is compared to other rat liver sulfotransferases (Support came from the U.D. Research Council and Honors Program).

10:15 IMIDOESTERS AS ANTISICKLING AGENTS: PROPERTIES OF MODIFIED HEMOGLOBIN S AS A FUNCTION OF IMIDOESTER CHAIN LENGTH. Marcia A. Hintz and David E. Albert, 1280 Mussel Dr., Maumee OH 43537.

Previous *in vitro* investigations using imidoesters (such as dimethyl adipimidate and suberimidate) as antisickling drugs found that these agents greatly increased oxygen affinity of hemoglobin. The resultant increased oxygen affinity would hinder the molecules' ability to deliver oxygen to peripheral tissues. In an effort to more fully understand and alleviate this complication, we performed a detailed study of the effect of imidoesters of various chain lengths on cooperativity, oxygen affinity and aggregation of hemoglobin S (HbS). We present here the results of our investigation which clearly demonstrates that modified HbS stability is quite variable and contingent on the chain length of the crosslinking reagent. Specifically, oxygen affinity, cooperativity, and aggregation of HbS are highly dependent upon the length of imidoester used. Hbs reacted with the antisickling agent dimethyl glutarimidate dihydrochloride had improved solubility, an oxygen affinity of 19.9 mm Hg and no loss of cooperativity (n=2.5). Consequently, this antisickling agent results in a HbS molecule with properties resembling those of HbA in normal blood.

10:30 TISSUE DISTRIBUTION STUDIES OF TIN ETIOPURPURIN IN C3H/HeJ MICE USING LIPOSOMES AS A DELIVERY SYSTEM. P. Sekher, G.M. Garbo* and Alan R. Morgan*, Dept. of Chemistry, University of Toledo OH 43606, *PDT Pharmaceuticals, 7408 Hollister Ave., CA 93117.

Photodynamic therapy (PDT) is a new treatment for cancer, which combines the use of a systematically administered sensitizer and the application of light. The title compound Tin etiopurpurin is a second generation sensitizer which is currently in clinical trial and has been proved to induce bladder tumor necrosis in rats. In this study we are reporting the biodistribution studies of Tin etiopurpurin using liposomes as a delivery system. 1,2-Dipalmitoyl-Sn-glycero-3-phosphocholine (DPPC) liposomes (SUV, small unilammellar vesicles and LUV, Large unilammellar vesicles) were prepared (with and without cholesterol) and administered to C3H/HeJ mice bearing RIF tumor. Sensitizer uptake after 3 and 24hrs was estimated fluorimetrically by extracting the sensitizer from various tissues. The results and their implications in PDT will be presented. (Supported by NIH Grant PO1-CA48733).

MEDICAL SCIENCES
9:00 AM - Saturday, April 23, 1994
Lucas
Fredika M. Robertson, Presiding

9:00 THE ROLE OF CELLULAR KINASES IN HERPES SIMPLEX VIRUS TYPE 1 INFECTION. Pasumponni Karuppanan and Darlene G. Walro, University of Akron, Dept. of Biology, Akron OH 44325-3908.

The phosphorylation of several virus specific and cellular proteins occurs during infection of cells *in vitro* with herpes simplex virus type 1 (HSV-1). The identity of the protein kinases which participate in the phosphorylation reactions is not known. The genome of HSV-1 encodes two putative protein kinases, US3 and UL13, but the physiological role of either protein kinase is not known. To determine this role of cellular protein kinases during HSV-1 infection, we compared the effect of several protein kinase inhibit ore on the production of HSV-1 wild type virus and R7041, a US3 defective virus. Vero cells were infected with virus at several multiplicities of infection (0.1, 1.0, and 10 virus per cell) and simultaneously treated with H-7, an inhibitor of AMP/GMP dependent kinases; with staurosporine, an inhibitor of protein kinase C; or with W-7, an inhibitor of calmodulin dependent kinases. Production of wild type and R7041 were equally inhibited by H7 and W7. However, R7041 virus appeared to be more sensitive to staurosporine than the wild type virus at all MOI tested. Cell viability was greater than 70% at all concentrations of drug tested. These results suggest that R7041 but not wild type virus may require protein kinase C or a substrate of the enzyme during infection.

9:15 ANALYZING THE EXPRESSION OF HUMAN MHC CLASS II MOLECULES IN TRANSGENIC MICE. Michelle K. Pignotti, Suzanne Mahon, Simon K Lawrance, Dept. of Life and Earth Sciences, Otterbein College, Westerville OH 43081-2006.

Tolerance, the ability to distinguish self from non-self in the immune system, a characteristic primarily regulated by the thymus, is being studied in transgenic mice which express human class II major histocompatibility complex (MHC) genes. MHC molecules are a group of polymorphic proteins necessary for antigen presentation to T cells, which subsequently provide immunity, if the T cells are not self reactive. MHC molecules are classified as heterodimers consisting of an α and a β chain. Mice of the B1 0.M strain possess mutations in both the α and β chains of the endogenous IE MHC genes. Human forms of MHC class II genes, DRα and DRβ, have been added to these B10.M mice to determine if normal function is restored. Here, we report analysis of the expression of the DRα and DRβ transgenes by two different methods. A histological analysis uses antibodies and staining techniques to search for protein products of histocompatibility genes in various tissues; the thymus, lymph nodes, and spleen have been examined. RNA analysis is performed by extracting RNA from various tissues, using gel electrophoresis to separate the RNAs, transferring the RNA to a nitrocellulose filter paper by northern blotting methods, and hybridizing the RNA with a known histocompatibility probe to show to what extent and in what tissues the RNA is present.

9:30 INFILTRATION OF MAC-1 EXPRESSING LEUKOCYTES IN MOUSE SKIN DURING MULTI-STAGE CARCINOGENESIS. Gautam N. Bijur, Fredika M. Robertson, Dept. of Medical Microbiology and Immunology, Ohio State University, 410 West 12th Ave., Columbus OH 43210.

Mac-1(CD11b) is an integrin expressed on monocytes and neutrophils. It is a heterodimeric glycoprotein with a unique alpha subunit and beta subunit common to both LFA-1 and p150,95. It functions as a receptor for the iC3b protein of complement and in cell-cell adhesion. The purpose of this study was to investigate Mac-1 expression by immunohistochemistry on mouse skin treated topically with 10ug of TPA (12-O-tetradecanoylphorbol-13-acetate) or a single application of 10nmol DMBA (dimethylbenzanthracene) followed by twice weekly applications of 2ug TPA for 22 weeks to induce the formation of skin papillomas. Skin and peripheral lymph nodes (PLN) were isolated at 4h, 24h, 48h, 72h, 96h after a single treatment of TPA and a second treatment of TPA 24h prior to sacrifice at 96h. Skin papillomas and lymph nodes were isolated at 22 weeks. Mac-1 expressing leukocytes infiltrated into the upper dermis as early as 4h and remained localized to this site at 48h. At 96h Mac-1 positive leukocytes were predominantly in the lower dermis. There were Mac-1 positive leukocytes in both papillomas and PLN isolated from mice at 22 weeks after DMBA treatment. These results surest that there is infiltration of Mac-1 expressing leukocytes during tumor promotion and there is a homing of Mac-1 expressing leukocytes to the lymph nodes. Mac-1 expressing leukocytes are also prevalent within skin papillomas and may contribute in part to the formation and continued growth of these tumors.

9:45 QUANTIFICATION OF NORMAL AND INDUCED ANGIOGENESIS IN THE CHICK CHORIOALLANTOIC MEMBRANE. Loren M. Kirchner (1), Ronald L. Salisbury (1) and Steven P. Schmidt (2), (1) Dept. of Biology, University of Akron, Akron OH 44325-3908, and (2) Dept. of Surgery, Vascular Research Lab and Division of Surgical Research, Akron City Hospital, Akron OH 44309.

Angiogenesis, the development of new blood vessels, is of importance in the progressive growth of tumors, metastasis, and wound healing. To study and evaluate the potential of a substance, e.g. growth factors, tumor tissue, cartilage extracts, to induce or block angiogenesis, angiogenesis assays are commonly used. Several assays have been developed of which the chick chorioallantoicmembrane (CAM) assay is the most widely used. This assay has many benefits in terms of low costs, ease of use and reduced ethical concerns, but to date has not been objectively quantifiable using visual methods. We studied the normal CAM using the shell-less and windowed chicken eggs, with and without tumor and control tissue grafts, and propose a method of quantification based on fractal geometrical principles. Using the box-counting method to determine the fractal (or similarity) dimension, Df, we have shown that the normally developing CAM has a Df of ca. 1.07 (day 4) and increases to ca. 1.60 (day 8-9). Tumor and graft induced angiogenesis shifts the Df local to the graft in a way that may be used as a numerical index to the level of vessel growth. We conclude that determination of the Df provides a unique, readily obtainable index of the angiogenic response that may easily be applied to other angiogenesis assays.

10:00 LABELED ANTIBODIES, NOT ALWAYS THAT SPECIFIC. Daniel W. Weed, David L. Mason, Miguel A. Pedraza, and John P. Boblett, Biology Dept., Wittenberg University, Springfield OH 45501.

Frozen sections on a 3 X 2.5 cm mass surgically removed from the stomach wall of a 72 year old female initially suggested a nodular lymphoma. Paraffin sections revealed large cells having the appearance of Reed-Sternberg Cells scattered between the lymphocytes. With the application of alkaline phosphatase conjugated antibody (Leu M1, CCD 15), which stains Reed-Sternberg cells, the entrapped cells reacted strongly positive, now seeming to clinch the diagnosis of Hodgkin disease. However, the cells of the neoplastic glands also stained positively. Closer inspection of the lower regions of the glands suggested that the large cells within the lymphoid nodules originated from malignant glandular epithelium. Alkaline phosphatase conjugated carcino-embryonic antibody (CEA) registered a strong reaction in the malignant cells. Flow cytometry showed polyclonal lymphocytes, and electron microscopy revealed the presence of well-defined desmosomes in the large cells. The final diagnosis was adeno-carcinoma. Significance? Treatment now required a second surgery involving a total gastrectomy.

PHYSIOLOGY - HYPERTENSION
1:30 PM - Saturday, April 23, 1994
Defiance
Daniel L. Ely, Presiding

1:30 INVOLVEMENT OF THE Y CHROMOSOME AND THE SYMPATHETIC NERVOUS SYSTEM (SNS) IN HYPERTENSIVE RATS. Hamid Daneshvar, Geoff Caplea, Kim Miller, Monte Turner, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective of this study was to determine if the hypertensive Y chromosome increases SNS dependent chronic stress sensitivity and blood pressure (bp). We have developed two new congenic substrains of spontaneously hypertensive rats (SHR's). The first substrain has 99% SHR autosomal genes and a WKY Y chromosome (SHR/a strain) and the second has 99% WKY autosomal genes and a SHR Y chromosome (SHR/y strain). SHR/a, SHR/y and WKY males (n=10/group) 5 weeks of age were placed in a colony with females of the same strain (n=10/group, 5 weeks of age) to produce territorial stress. Bp was measured weekly. Bp differences between different strains were as follows: 1) SHR/y males in the colony had significantly higher bp (165 mmHg) compared to: a) SHR/y male controls (152 mmHg $p<.03$), b) SHR/a colony males (142 mmHg $p<.01$), c) SHR/a control males (135 mmHg $p<.05$), d) WKY colony males (145 mmHg $p<.07$) or WKY control males (122 mmHg $p<.01$). In all cases animals in the territorial stress condition had significantly higher bp as compared to controls. Bp upon termination taken by tail artery catheter correlated closely to indirect bp ($r=.96$, $p<.01$). Plasma norepinephrine was elevated in SHR/y males after high stress as compared to WKY males. The hypertensive Y chromosome significantly elevated bp and plasma NE which supports the hypothesis that there is an interaction between the Y chromosome and the SNS.

1:45 THE HYPERTENSIVE Y CHROMOSOME INFLUENCES BLOOD PRESSURE BETWEEN 21-28 DAYS OF AGE. Linda Barrett, Monty Montgomery, Monte Turner, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Our laboratory has shown that the rat Y chromosome from a spontaneously hypertensive (SHR) father leads to an increase in blood pressure (bp) not seen with the Y chromosome from a normotensive father. We have observed a bp difference at 6 weeks of age, but have not had the technique to find out if the bp difference occurs earlier. In order to determine the age at which bp differences between strains are significant we developed a technique to measure systolic bp using tail cuff sphygmomanometry in the 14 day-old rat. BP was measured in four groups (n=8/group) of male rats (SHR, WKY, SHR/a, SHR/y). The SHR/a has the autosomes of the SHR, and the Y chromosome of the WKY, and the SHR/y has the autosomes of the WKY and the Y chromosome of the SHR. Pressures and body weights were taken at 14, 18, 21, 28, and 35 days of age. The SHR/a males had significantly higher bp than that of the SHR or WKY ($p<.05$). Preliminary data indicates that the SHR/y had higher bp than WKY, but similar to SHR. In conclusion, the hypertensive Y chromosome produced an early and substantial rise in systolic bp.

2:00 SODIUM APPETITE IS MEDIATED BY SYMPATHETIC OUTFLOW AND THE Y CHROMOSOME. Lawrence Ely, Michael Herman, Linda Barrett, Monte Turner and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Our laboratory investigated the effects of stress upon sodium (Na) appetite and the influence of the Y chromosome on hypertension. The objectives of the following studies were to determine 1) if female rats from several strains have higher Na appetite than males, 2) if the sympathetic nervous system (SNS) mediated this effect, and 3) if the Y chromosome from a hypertensive father increased Na appetite. Four rat strains (n=10/group) of both sexes were used (n=80 total); Wistar Kyoto normotensive (WKY), hybrid back cross with a Y chromosome from a hypertensive father (SHR/y), spontaneously hypertensive rat (SHR) and hybrid back cross with a Y chromosome from a normotensive father (SHR/a). Each cage had a 4 water bottle preference using: 0, 0.5, 1.0, 1.5% NaCl solutions. Females of all strains had about 100X greater Na appetite than males ($p<.001$), intruder stress increased Na appetite more in males than females ($p<.01$), clonidine (sympathetic blocker) decreased Na appetite in the hypertensive strains but not WKY but preference for the 0.5% Nacl did not change. There was a hypertensive Y chromosome effect with SHR/y males having 100% higher baseline Na appetite as compared to WKY males ($p<.01$). In conclusion, the higher Na appetite in females is partially mediated through the SNS in hypertensive strains but not WKY and the hypertensive Y chromosome is partially responsible for the increased Na appetite in SHR/y and SHR as compared to WKY.

2:15 THE ANDROGEN RECEPTOR AND HYPERTENSION. Don Molnar, Daniel Ely, and Ronald Salisbury, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective of the following study was to determine if testosterone (T) or dihydrotestosterone (DHT) replacement therapy increased blood pressure (bp) in castrated male and testicular feminized male (Tfm) rat hybrids. Along with bp measurements blood was

collected for catecholamine, DHT, and T analysts. The hybrid strain was created by crossing spontaneously hypertensive male rats (SHR) with testicular feminized male (Tfm) carrier normotensive King-Holtzman females. The Tfm rats lack a functioning androgen receptor. Rats were castrated at week 4 and given silastic implants of either T, DHT, or sham. BP was recorded from week 5-15 by the tail cuff technique, blood was taken starting at week 8, then every three weeks. After 15 weeks rats were terminated and hearts, kidneys, adrenals, pituitaries, and brains collected. After 15 weeks bp was 158 mmHg for the male castrated rats with T implants, which was similar to controls. The male sham implanted rats were 147 mmHg. The male DHT implanted rats were 132 mmHg, and the Tfm rats were 137 mmHg. In conclusion, T but not DHT restored bp in castrated hybrids and a functional androgen receptor was necessary.

2:30 EFFECTS OF 5A-DIHYDROTESTOSTERONE ON BLOOD PRESSURE IN THE CASTRATED SHR/TFM HYBRID RAT.

Qiman O. Zhao, Ronald L. Salisbury, Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

This study examined the role of the androgen receptor on the development of hypertension in a hybrid rat model. Spontaneously hypertensive males (SHR) were crossed with females carrying the gene for testicular feminization (Tfm). The hybrid offspring were all hypertensive. The hybrid Tfm male lacks an androgen receptor, but its sibling brother has normal receptors. Both groups were castrated at 4 weeks of age. 5a-dihydrotestosterone (DHT) was implanted at 6 weeks of age and weekly blood pressures were recorded for 8 weeks. All data were analyzed by a two-way ANOVA (treatment x phenotype) and the results showed a significant main effect of treatment ($p<0.05$). At no time was there a significant difference in blood pressure between the Tfm and its control. However, significant differences were observed between the male sibling receiving DHT and its control during the early weeks of the experiment. We, therefore, conclude that the androgen receptor did have a role on the development of hypertension in this animal model.

2:45 THE INTERACTION OF TESTOSTERONE, NORPINEPHRINE AND THE Y CHROMOSOME UPON BLOOD PRESSURE IN HYPERTENSIVE AND NORMOTENSIVE RAT STRAINS.

Denise Goray, Gail Dunphy, Dean Petrinec, Lawrence Ely, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective was to determine if the sympathetic nervous system also interacted with the Y chromosome and androgens. Four strains of rats were utilized; 1) WKY, a normotensive strain, 2) SHR, a spontaneously hypertensive strain, 3) SHR/a, a strain possessing hypertensive autosomal genes with a normotensive Y chromosome, and 4) SHR/y, a strain possessing normotensive autosomal genes with a hypertensive Y chromosome. Three treatment groups were examined: 1) clonidine, an α-adrenergic sympathetic receptor blocker, 2) flutamide, an androgen receptor blocker, and 3) both clonidine and flutamide. Blood pressure (bp) was measured weekly between 5 and 22 weeks of age. Blood samples were collected and the serum was analyzed for norepinephrine and testosterone. In the clonidine group during stress, bp was higher in the SHR (160 mmHg) and SHR/y (161) when compared to the SHR/a (140) and WKY (152) which renders the SHR and SHR/y similar and the SHR/a and WKY similar. The bp in the clonidine/flutamide group were similarly reduced in all strains due to the blockage of both hypertensive components. In conclusion, the SNS appears to interact with the hypertensive Y chromosome and androgens to produce an increased resting and stress-induced rise in bp.

3:00 THE POST-NATAL EFFECTS OF 1,4,6 ANDROSTATRIEN-3,17 DIONE(ATD) ON HYPERTENSION IN THE SPONTANEOUSLY HYPERTENSIVE MALE RAT (SHR).

Dexter L. Lee, Ronald L. Salisbury, Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective of this study was to determine the effect of blocking estrogen formation during the first postnatal week of life on the development of hypertension in hybrid spontaneously hypertensive male rats (SHR). Estrogen formation (aromatization) plays a key role in the mechanism of androgen-induced sexual differentiation of the central nervous system at this time (Naftolin et al., 1975; MacLusky & Naftolin, 1981). Thus we sought to measure whether brain sexual differentiation was responsible for the sex difference in blood pressure observed in this strain. Male pups were obtained from a cross of female King-Holtzman rats with male SHR. They were implanted with the aromatase inhibitor, 1,4,6 Androstatrien-3,17 Dione(ATD) on the third postnatal day of life. Blood pressures were measured weekly from postnatal days 35 to 84 and the data analyzed by one-way ANOVA. At week 12 the average blood pressures were 163 +/-12 and 177 +/- 8 mmHg in the ATD and control groups, respectively. We conclude that blockade of estrogen formation during the first postnatal week of life did not affect the development of hypertension in the hybrid SHR male.

3:15 CIRCADIAN BLOOD PRESSURE VARIABILITY IS ENHANCED BY SOCIAL INTERACTION USING TELEMETRY.

Ann Caplea, Gail Dunphy, Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

It is generally accepted that blood pressure (bp) fluctuates over a 24 hr period. In humans it has been suggested that internal regulation and activity are responsible for the 24 hr bp variability. Therefore, the purpose of this experiment was to determine in rats: 1) if 24 hr bp in individually caged and socially interacting colony housing were different, 2) if there was a Y chromosome hypertensive effect. Two substrains, SHR/y and SHR/a, were compared to WKY and SHR. All rats were on a high sodium (3%) diet for the duration of the experiment. Continuous bp was monitored using aortic radio-telemetry (Data Sciences). All strains showed a significant bp increase ($p<.01$) during the dark cycle versus the light cycle except for the caged WKY strain. However, the colony rats of all strains had greater dark cycle bp increases than strain matched caged animals. Overall, caged animals spent at least 68% of the 24 hr period with pressures <150 mmHg, whereas colony rats' pressured increased considerably SHR/y colony rats spent 27% of their time at a bp >166 mmHg and SHR/y caged spent 6% of their time at a bp >166 mmHg as compared to WKY colony rats spent 10% of their time >166 mmHg and WKY caged spent 0% at >166 mmHg. In conclusion, although circadian patterns may be internally regulated, the extent of bp variability is enhanced by social interaction, and the Y chromosome increased bp in normotensive rats in colony and caged conditions.

3:30 CROSS FOSTERING HYPERTENSIVE RATS ALTERS BLOOD PRESSURE.

Tonous Silfani, Linda Barrett, Monte Turner, Ronald Salisbury, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective of this study was to determine the mechanism by which blood pressure (bp) of hypertensive pups is reduced by cross-fostering to a normotensive mother. This study used two new substrains of rats. The SHR/a has 99% SHR autosomal genes and a WKY Y chromosome, and the SHR/y has 99% WKY autosomal genes and a SHR Y chromosome. Two sets of three WKY females were placed in breeding cages with one SHR/y male. Also, two sets of three SHR females were placed in a cage with one SHR/a male. When the mothers delivered, the number of pups and sex was recorded, and at that time a lactating WKY or SHR foster mother was put in her place. Body weights were taken, weekly and beginning at two weeks, bp was taken weekly, utilizing the tail cuff method. At 6 and 10 weeks, blood samples were taken using retroorbital techniques for standard blood chemistry. BP of the following groups at 21 days just before weaning was: SHR/a fostered to WKY = 88+/-12, mmHg, SHR/a fostered to SHR = 115+/-7 mmHg, SHR/y fostered to WKY = 84+/-12 mmHg and SHR/y fostered to SHR = 72+/- mmHg. The bp effect of the Y chromosome was not influenced by maternal factors in the first 21 days. In conclusion, hypertensive foster mothers either through milk bourn factors or behavioral factors increased the male pup's bp 27 mmHg by day 21 if the male pups also had autosomal hypertensive genes.

3:45 AN ALPHA-ADRENERGIC BLOCKER DECREASES BLOOD PRESSURE STRESS RESPONSIVENESS IN HYPERTENSIVE AND NORMOTENSIVE RATS AS MEASURED BY AORTIC TELEMETRY.

Gail Dunphy, Ann Caplea, Monte Turner, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

We examined the blood pressure (bp) and heart rate (hr) responses in the spontaneously hypertensive rat (SHR), Wistar-Kyoto rat (WKY) and two FX hybrid backcrosses under acute stress and high Na conditions and after alphaadrenergic blockade using phentolamine. The two hybrid crosses were bred in our lab to produce males with a Y chromosome from a hypertensive father and normotensive autosomes (SHR/y) or the reciprocal cross producing a male with a normotensive Y chromosome and hypertensive autosomes (SHR/a). BP and hr were measured using an aortic implanted radio-telemetry system. The rats (16-20 wks) were placed on a high Na (3X) diet. Air stress (30 sec) increased bp 21-25% ($p<.05$-$p<.01$) in rats with a hypertensive Y chromosome but only 11-17% ($p<.01$) in rats without the hypertensive Y chromosome. HR increased about 6% in all groups after air stress with no significant strain differences. Alpha adrenergic blockade prevented the air stress bp response in all groups. HR reflexly increased after alpha blockade in all groups (7-42%), however, the SHR group had the highest hr increase of 42% ($p<.001$), whereas SHR/a only had a 7% increase. In conclusion, the hypertensive Y chromosome increases pressor responsiveness by about 8% (10-15 mmHg) and maximal hr elevation after alpha blockade appears to require both hypertensive autosomes and the Y chromosome.

4:00 TERRITORIAL STRESS ELEVATES BLOOD PRESSURE IN FEMALE HYPERTENSIVE, AND NORMOTENSIVE RATS.

Kim Miller, Hamid Daneshvar, Geoff Caplea, Monte Turner, Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

The objective of this study was to determine if territorial stress would increase blood pressure (bp) in female rats from different genetic lines. Spontaneously hypertensive female rats (SHR), Wistar Kyota normotensive females rats (WKY) and hybrid female backcrossed rats to SHR (SHR/a) or WKY (SHR/y): (n=10/group, 5 weeks of age) were placed in a colony with males of the same strain, age and number, and control groups were housed in standard lab cages with minimal stress. BP was measured weekly using the tail cuff technique. Pressure differences between different strains were as follows: colony SHR/y females had (significantly) higher bp (154 mmHg) compared to: control SHR/y females (144 mmHg $p<.02$), SHR/a colony females (143 mmHg $p<.01$), SHR/a control females (134 mmHg $p<.01$), WKY control females (145 mmHg $p<.02$), and WKY colony females (143 mmHg $p<.01$). SHR/a colony females had (significantly) higher bp (143 vs 134 mmHg $p<.02$) compared to SHR/a control females. All animals had blood drawn on the 5th, 8th and 11th week of bp measurements. SHR colony females had higher levels of norepinephrine compared to SHR control females (299 vs 194 pg/ml, $p<.05$). Direct tail artery bp was taken at 15 weeks and these values confirmed the tail cuff bp. These data suggest that under high stress situations, SHR/a and SHR/y females show a significantly higher bp, which may be due to elevated plasma norepinephrine, as compared to their control counterparts.

4:15 A DEVELOPMENTAL STUDY OF COLLAGEN CONTENT IN THE MESENTERIC ARTERY, AORTA, AND CORONARY ARTERY OF SPONTANEOUSLY HYPERTENSIVE (SHR) AND NORMOTENSIVE RATS

(WKY). Maria Karasarides, Doug Chonko, Daniel Smith, and Daniel Ely, Dept. of Biology, University of Akron, Akron OH 44325-3908.

Earlier studies showed that collagen content in the mesenteric artery of SHR rats was higher than the WKY strains. However, it remains unclear whether this increased collagen deposition is laid down first causing a rise in the blood pressure (bp), or whether the increased collagen is a compensative reaction to increased bp. In order to examine this question three age groups of both SHR and WKY males and females (n=4/group) were selected: 4, 10, and 20 weeks. BP was measured weekly by the tail cuff method. Mesenteric arteries and aortas were prepared for high pressure liquid chromatography analysis, for hydroxyproline, hearts were taken, and coronaries were prepared and stained with Sirius Red. These were then viewed using an Image Analysis software program to quantitate collagen content around the coronary. Male SHR had more collagen deposition at all ages than WKY. The bp at all ages was higher in the SHR males as compared to WKY (138 vs 124 mmHg at four weeks, 172 vs 145 mmHg at 10 weeks and 200 vs 145 mmHg at 20 weeks). In conclusion the developmental study showed that collagen differences are apparent simultaneously with increasing b.p.

4:30 DETERMINATION OF COLLAGEN CONTENT IN THE CORONARY AND MESENTERIC ARTERIES OF NORMOTENSIVE AND HYPERTENSIVE RATS. Doug Chonko, Maria Karasarides, Daniel Smith and Daniel Ely, Dept. Biology, University of Akron, Akron OH 44325-3908.

The objective of this study was to determine if coronary and mesenteric collagen content was directly correlated with blood pressure (bp) in rats with varying degrees of hypertension. Silicone rubber was injected by retrograde perfusion in the coronaries in order to make a cast and the vessels were dissected, defatted, dried, weighed, homogenized, and hydrolyzed for 24 hours at 110 degrees C, and the amino acids were quantitated by high performance liquid chromatography. The SHR/y strain, which was basically a WKY rat with a Y chromosome from a hypertensive father, had significantly greater collagen in both the coronary and mesenteric arteries than the WKY (28%, 31% increased, $p<.05$, $p<.05$ respectively). The SHR/a strain, which was basically a SHR rat with a Y chromosome from a normotensive father, had significantly less collagen than the SHR group in the coronary and mesenteric arteries (56%, 33% decrease, $p<.01$, $p<.05$ respectively). The bp of the four groups at 20 weeks were: SHR-200 +/- mmHg, SHR/a-149 +/- 3 mmHg, SHR/y-153 +/- 4 mmHg, WKY-128 +/- 7 mmHg. The collagen in the coronary and mesenteric arteries was found to correlate significantly ($r=0.75$, $p<.001$, $r=0.77$, $p<.001$, respectively) with bp. In conclusion, the Y chromosome from a hypertensive father significantly contributes to increased bp and either directly or indirectly elevates coronary and mesenteric artery collagen.

Social and Behavioral Sciences Division
PSYCHOLOGY: MEMORY, LEARNING AND COMPREHENSION
9:00 AM - Saturday, April 23, 1994
Huron
John J. Skowronski, Presiding

9:00 THE EFFECTS OF CNQX AND AP5 AFTER A UNILATERAL ENTORHINAL CORTEX LESION IN A SPATIAL ALTERNATION TASK. Lana Juliette Rucks, Ohio Wesleyan University, Hamilton-Williams Box 2070, Delaware OH 43015.

This study investigated the effects of ciano-nitro-quionoxalinedione (CNQX) and aminophonovaleric (AP5) on a learned spatial alternation task. Sprague-Dawley rats were trained in a spatial alternation task, Y-maze, in which they needed to alternate arms until they achieved criterion, 80% accuracy for 3 days. The day after achieving criterion, the animals were subjected to a unilateral entorhinal lesion by eletrocoagulation and a cannulae implant in the hippocampus. Previous research has shown that unilateral entorhinal cortex lesions cause sprouting in the hippocampal formation. The animals were given 14 days to recover after which time the animals were trained until they met criterion again. The day after reaching criterion the second time, the animals were given daily micro-hippocampal injections of CNQX or AP5. The animals performance in the Y-maze was tested 10 min after the rats were injected. Preliminary results reveal that rats injected with CNQX caused an increase in errors were as rats injected with AP5 did not. These results indicate that CNQX injected into the area of hippocampal reinnervation causes an impairment in spatial alternation behavior.

9:15 AUTOBIOGRAPHICAL MEMORY FOR SELF AND OTHER EVENTS: PREDICTORS AND POSSIBLE MEDIATIONAL PROCESSES. Julie Hott and John Skowronski, Ohio State University at Newark, 1179 University Dr., Newark OH 43055-1797.

For ten weeks, subjects in this study kept a diary of events in their lives. Two event types were recorded, self-events and other-events. Ratings of each event's valence, extremity, and person typicality were obtained at the time each event was entered into the diary, as well as a measure of the level of mental involvement that subjects experienced with each event. Later, subjects provided rating of how well they remembered each event, and of how often they rehearsed each event. Results indicated that memory ratings were higher for self-events than for other-events, for events that were highly person-atypical than for events that were person-typical, and for events that were extreme than for events that were not extreme. Positive events were better recalled than negative events, but only when those events were self-events; when the events were other-events, negative events were better recalled than other events. Mediation analyses suggested that this positivity effect in self-event recall may have been due to heightened mental involvement in the positive events at encoding, but that the negativity effect in other-event recall may have been due to heightened rehearsal for the negative other-events.

9:30 AUTOMATIC AND CONTROLLED PROCESSES IN JUDGMENTS OF HOMOSEXUALITY. Tamara Orr and John Skowronski, Ohio State University at Newark, 1179 University Dr., Newark OH 43055-1797.

Prior research (e.g., Skowronski, Carlston & Isham, 1993) indicates that the judgments and memories produced when subjects make judgments by means of relatively automatic process can differ from the judgments and memories produced when judgments are made by means of relatively controlled processes. We attempted to examine this possibility in the context of judgments of homosexuality. Subjects read about a target who exhibited both homosexual-consistent and homosexual-inconsistent behaviors. Some subjects read this description under conditions designed to promote controlled processing, while others read this description under conditions designed to promote automatic processing. Subjects then engaged in a surprise recall task, reported judgments of the target's traits, and reported a judgment of whether the target fit the homosexual stereotype. The effect of the type of processing on memories and judgments was assessed. In addition, the relation between several individual differences variables thought to be related to the accessibility of the homosexuality construct (homophobia, sex-role strength, gender) and the dependent measures were also examined.

9:45 THE EFFECTS OF INTERSTIMULUS INTERVAL ON THE LEARNING AND PERFORMANCE IN SERIAL FEATURE POSITIVE DISCRIMINATIONS. Patricia A. Hamlin & Peter C. Holland, College of Wooster, Box C-1766, Wooster OH 44691.

In this experiment, rats were trained with operant serial feature positive (SFP) discriminations (X->A+, A-), in which responding during a target cue (A) is reinforced (+) when A is preceded by a feature cue (X) and separated by 5-s or 25-s interval but nonreinforced (-) when A is presented alone. Solution of the task demands that the subjects retain some trace of the feature cue when the target is presented. This research examined effects of imposing retention intervals that were either longer or shorter than the intervals used in training to determine if subjects encode temporal aspects of the learning task. Thus, increasing the retention interval would degrade performance by making test conditions progressively more different from training conditions. However, if performance is governed by the strength of a fading memory trace, then performance should get worse when the retention interval is extended beyond the training interval, but improve when the interval is shortened. Different subgroups of rats received different combinations of auditory and visual stimuli as X, Y, A, and B, in order to examine the effects of both modality and similarity of feature and target on learning and memory of these tasks. Although neither modality of the feature cue nor similarity of feature and target cues affected performance, auditory target cues were superior to visual targets. Rats performance when trained with 5 s intervals deteriorated rapidly as the interval was extended to 10, 15, 20, 25, or 30 s, and when it was reduced to 0 s. Similarly, rats trained with 25-s intervals performed reliably poorer at both shorter (0, 5, 15 s) and longer (35, 40 45, 50, and 55 s) test intervals than at original training intervals and those similar (20 and 30 s). These data suggest that performance of a SFP discrimination reflects representation of particular time intervals rather than the fading of a memory trace over time.

10:00 MORE EVIDENCE FOR SPONTANEOUS SOCIAL INFERENCE USING A SAVINGS TASK. Matt Crawford, John Skowronski, and Pat Quickle. Ohio State University at Newark, 1179 University Dr., Newark OH 43055-1797.

A continuing debate exists in the social psychology literature concerning whether, and when, people make spontaneous inferences about others. Part of the difficulty in this area has been the development of a research paradigm that is sensitive to inference-making, but that does not directly ask subjects to report their inferences (which could itself prompt the inferential process). In a series of studies (Carleton & Skowronski, 1994) evidence indicating that such inferences occur was obtained using a savings (or re-learning) paradigm. In this paradigm, after first being exposed to a behavior that has trait implications presented with a photo of the person, subjects later more easily learn a person photo-relevant trait word pairing in a paired associates task (a savings effect). In the present studies, we explore whether these savings effects require that inferences be made consciously, or whether these effects require recall of the relevant behavior.

10:15 CEBUS APELLA'S UNDERSTANDING OF LAWS OF GRAVITY AS EVIDENCED THROUGH PREFERENTIAL LOOKING. Patricia A. Hamlin and Claudia R. Thompson, College of Wooster, Box C-1766, Wooster OH 44691.

The present research examined the existing knowledge *Cebus apella* monkeys have about physical concepts such as gravity. These experiments extended and combined research on human infants with research on infant chimpanzees. In the primary experiment, monkeys

were presented with two situations in which a box was supported by a platform. The box was either wholly on the support, 50% off, or 66 2/3% off the support. The monkeys average looking time was measured for the various stimulus presentations. Such presentations did or did not violate the monkeys' knowledge of the world (i.e. gravity). If an event did not coincide with the monkeys' experience, it was predicted that the monkeys would look reliably longer at those events as indicated by previous research. This study surveyed not only how *Cebus apella* monkeys comprehend gravity, but also how that understanding compares with that of human infants tested on similar tasks. Completion of the experiment is anticipated for February 1994.

10:30 POSTER BREAK

SOCIAL PROCESSES AND SOCIAL WORK: IMPLICATIONS FOR PRACTICE

1:30 PM - Saturday, April 23, 1994

Huron

Glenn A. Shields, Presiding

1:30 "TRUST AND OBEY": CONFORMITY AND CONTROL IN THE DISCIPLING MOVEMENT. THOMAS G. LANE, DEPT. OF SOCIOLOGY, UNIVERSITY OF CINCINNATI, CINCINNATI OH 45221-0378.

Compliance with group expectations, at least at some minimal level, is necessary for the functioning, indeed the very existence, of any social group. But some groups seek and obtain extraordinary degrees of conformity from their members. A case study of a contemporary authoritarian religious sect was undertaken to ascertain correlates of radical conformity. Data were gathered from participant observation, and from open-ended interviews exploring for comparison the sect histories of members, former members, and nonmembers for whom the group's recruiting did not suffice to elicit conversion. The study was essentially qualitative and theoretical. Conventional perspectives focusing on the charisma of leaders and the psychological vulnerabilities of recruits were found to be only partially appropriate accountings of sect attraction and retention of members. Group processes involving rewards, sanctions, modeling, and a compelling semiotic system fostering a particular group-bonding social construction of reality were determined to amply explain the profound conformity observed within the sect. In contradiction to the popular "brainwashing" and "snapping" models, it was concluded that the dynamics which operate in authoritarian groups likely differ only in extent or intensity, and not in kind, from the socializing and consensus-sustaining forces which operate in any social group or in society at large.

1:45 MULTIPLE-TRAIT IMPRESSION FORMATION IN DEPRESSED AND NONDEPRESSED SUBJECTS. MICHELLE MONROE AND JOHN SKOWRONSKI, OHIO STATE UNIVERSITY AT NEWARK, 1179 UNIVERSITY DR., NEWARK OH 43055-1797.

Research by Carlston (1979) indicates that people are more likely to derive multiple trait inferences about a person from a person description containing multiple behavioral episodes that each have relatively clear implications for a single trait than from a person description containing a single behavioral episode that has implications for multiple traits. Our research attempts to replicate this finding, and examines whether this outcome may depend on the personality of the perceiver. Because recent research by Weary and her colleagues has indicated that mild to moderate depressives process social information differently than non-depressives, we examined whether mild to moderate depressives (as measured by the Beck Depression Inventory) and non-depressives differ in their tendency to draw multiple inferences from single-implication and multiple-implication behavioral episodes.

2:00 VARIATIONS AND MODIFICATION OF MALE ANGER. CAROL COSTLOW, CHRISTIE I. PARTLO, & SARA R. STAATS, 7123 NATIONAL RD., PATASKALA OH 43062.

Aggression and the expression of anger are pre-eminent problems in the United States. Much of the aggression and violence is perpetuated by young males and so they are a population of special interest. Aggression is primarily an interpersonal interaction and is often situation specific. In this experiment, we used a mood induction technique to influence aggression toward a designated target, "an older person" who was presented in six different situations. Forty-two male and 66 female undergraduates from a psychology class (mean age - 23.8, S.D. = 8.1) volunteered for partial course credit. Control subjects responded to the Situation Reaction Inventory, an instrument that presents target individuals in typical agonistic situations. Experimental subjects first were asked to recall specific situations, e.g., a time when they felt sorry or empathetic for an older person (Experimental One) or a time when an older person made them angry (Experimental Two), and then to complete the situation Reaction Inventory. Results confirmed that males were more aggressive than females and that males were more variable in their aggressiveness than females. The experimental conditions produced changes for males but not for females. For males, both experimental conditions produced changes in aggression in comparison to the control condition. Manipulation of aggressive responses to agonistic situations such as social insult, property damage, or threat of personal harm is discussed.

2:15 WISHES AND EXPECTATIONS FOR CHANGE AND RESPONSES TO THREAT IN BATTERED AND NON-BATTERED WOMEN. CHRISTIE I. PARTLO & SARA R. STAATS, OHIO STATE UNIVERSITY AT NEWARK, 1179 UNIVERSITY DR., NEWARK OH 43055-1797.

Differences between battered and non-battered women's wishes and expectations for change and their responses to threat were examined. Twenty-two battered and 51 non-battered women from a small mid-western commuter campus completed a modified version of the Hope Index and the Situational Reactions Scale (SRS). There were no significant differences between the battered and non-battered women in terms of age, income, education, or number of children. Battered women scored significantly higher than non-battered women on wishes for their partner to change and wishes for themselves to change. However, there were no differences between battered and non-battered women's expectations for change for their partners or themselves. Difference t's showed that battered women's wishes were significantly higher than their expectations for changes in both themselves and their partners. This was not the case for non-battered women. Battered women scored significantly higher than non-battered women on the SRS sub-scale dealing with threat. There were no significant differences between battered and non-battered women on the other SRS sub-scales dealing with different situations. Battered women scored highest on the SRS sub-scale dealing with threat when the instigator in the situation was a man. Possible causes and implications of these findings will be discussed.

2:30 PERCEPTIONS OF COHESION, ADAPTABILITY, AND CONFLICT RESOLUTION AMONG BATTERERS. GLENN A. SHIELDS, D.S.W., DEPT. OF SOCIAL WORK, BOWLING GREEN STATE UNIVERSITY, BOWLING GREEN OH 43403.

A family functioning model was used to assess conflict resolution among 53 male batterers who were court ordered into an 18 week domestic violence treatment program. The tactics of the batterers were identified through the use of Straus' 1979 Conflict Tactic Scales (CTS). The CTS measures three levels of tactics that are most often used to resolve conflict among those involved in domestic violence; reasoning, verbal aggression, and physical violence. The various types of conflict resolution tactics were compared to three major family types; balanced, moderate, and extreme families. Family types were identified within the context of the Circumplex Model of family functioning (Olson, Russell, and Sprenkle, 1979). In addition to the CTS, each respondent was administered the Family Adaptability Cohesion Evaluation Scale (FACES) (Olson, et al., 1985) as part of the assessment process. This model of family functioning hypothesizes 16 family types based on two major dimensions, cohesion and adaptability. The research used a completely deviant population (spouse abusers) to try and determine the usefulness of this model to identify characteristics of abuse. The hypothesis states that families who are more balanced to moderate in terms of cohesion and adaptability will be more flexible, utilize reasoning, and compromise in conflict resolution. Families who perceive themselves as more extreme in terms of levels of cohesion and adaptability will be more likely to use verbal aggression and physical violence to resolve conflict. Implications for practice and further research are identified.

2:45 SOCIAL WORK ADVOCACY ON BEHALF OF THE MENTALLY DISABLED PURSUANT TO THE AMERICANS WITH DISABILITIES ACT, A COST/BENEFIT FACTORING APPROACH. ROBERT M. CIKRAJI, J.D., M.S.W., BUSINESS ADMINISTRATION DEPT., 25 MILLER HALL, ASHLAND UNIVERSITY, ASHLAND OH 44805.

The Americans with Disabilities Act of 1990 expands the advocacy role of the clinical social worker, occupational social worker, and case manager. Effective July 26, 1992, ADA prohibits employers, state and local governments, employment agencies and labor unions from discriminating against individuals with physical and mental disabilities. However, a client-centered advocacy approach must include a cost/benefit analysis on behalf of individuals with a diagnoses of major mental illness. A twelve-point evaluative process is presented to insure that the advocacy role is utilized only in situations where the value of the employment relationship exceeds the immediate and potential economic, social and psychological hardships which accompany a major life-changing event. A psycho-social legal approach is utilized.

3:00 CLINICAL AND LEGAL ISSUES RELATED TO PSYCHOLOGICAL ASSESSMENT OF THE MENTALLY DISABLED PURSUANT TO THE AMERICANS WITH DISABILITIES ACT. ROBERT M. CIKRAJI, J.D., M.S.W., BUSINESS ADMINISTRATION DEPT., 25 MILLER HALL, ASHLAND UNIVERSITY, ASHLAND OH 44805.

Title I of the Americans with Disabilities Act of 1990 which took effect July 26, 1992, prohibits employers, state and local governments, employment agencies and labor unions from discriminating against qualified individuals with physical or mental disabilities in the application for employment process, hiring, discharging, advancement, compensation, job training and other terms and conditions of employment. Employers will increasingly defer to clinical opinions of treating and consulting psychologists in four major areas of employability of individuals with diagnoses of major mental disorders: (1.) diagnosis, (2.) assessment of past and present functioning, (3.) prognosis as it relates to course of the illness including behavior characteristics and viability of medication for aggressive behavior, (4.) type of accommodation which would permit the individual to perform the employment tasks. A six-step analysis to avoid civil liability in ADA related assessment matters is presents to insure a sound clinical approach to individuals who have identifiable mental disorders and with or without reasonable accommodation can function in an employment relationship.